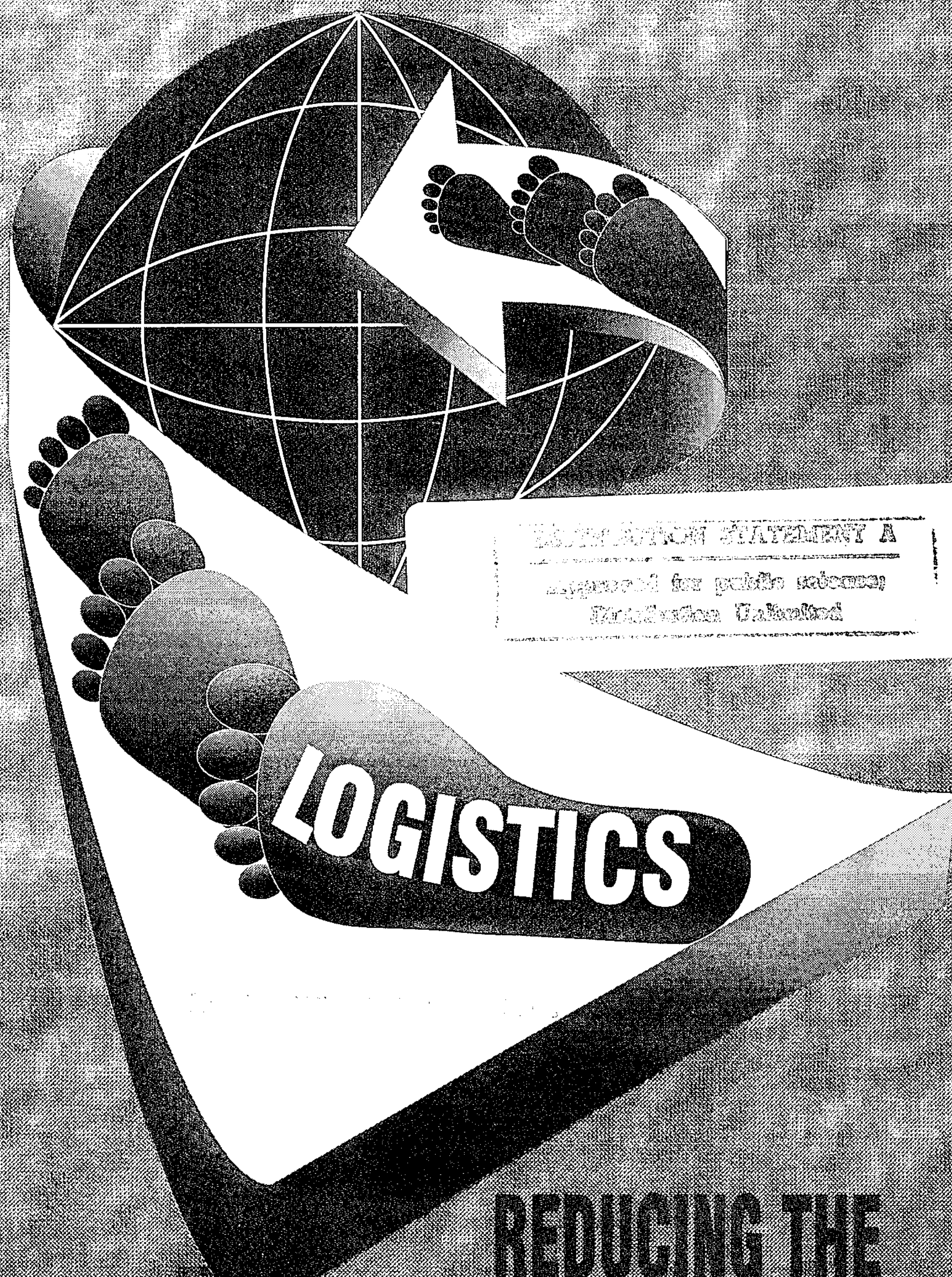
FALL 1995

AIR FORCE JOURNAL of LOGISTICS



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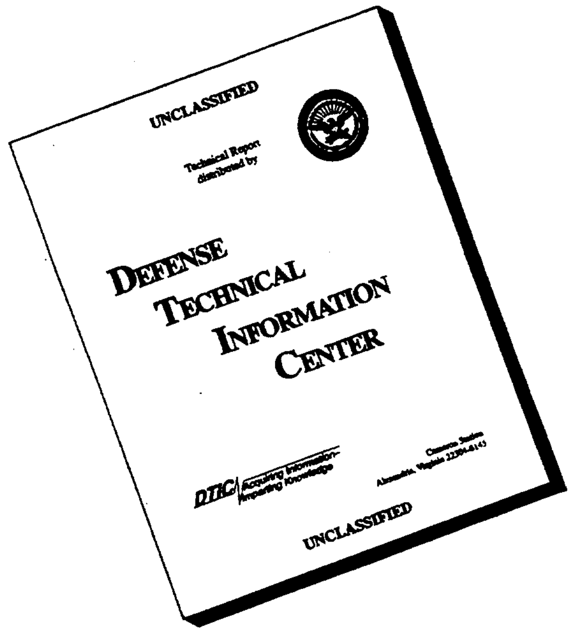

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Purpose The *Air Force Journal of Logistics* provides an open forum for the presentation of issues, ideas, research, and information of concern to logisticians who plan, acquire, maintain, supply, transport, and provide supporting engineering and services for military aerospace forces. It is a non-directive, quarterly periodical published under AFI 37-160V4. Views expressed in the articles are those of the author and do not necessarily represent the established policy of the Department of Defense, the Department of the Air Force, the Air Force Logistics Management Agency, or the organization where the author works.

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A New Look at Wholesale Logistics

Wing Commander David J. Foster, RAF

Introduction

Budgets are shrinking, force structure is reforming around smaller numbers, yet the mission of the Air Force is broadening in scope. We face demands for flexible, innovative, and cost-effective readiness for a broader range of force deployment and employment options. Not only do we need responsive, effective, and frugal characteristics throughout the support chain, we need our partners in industry to pursue these goals with equal vigor.

In this context we are told that in the future, the challenge for the logistician will be to deliver the highest level of support to the war fighter in the face of scarcity of resources, variability in support performance, and uncertainty of demand. So what's new?

Certainly not the challenge. For as long as there has been an Air Force, young people have grown old and weary battling with this frustrating, exciting, vital task. And, despite this effort, in large measure, we have not solved the problems, but merely learned how to live with them. This has cost a great deal of money. So what's new?

In a word, perspective. There is a revolution going on. We are experiencing a radical change in the way we look at logistics—a fresh perspective. Like most revolutions, it engenders strong reactions. For instance, if we follow the new approach to business, many things can be done more simply. This leads not to rejoicing, but to considerable skepticism. The argument goes: "If it was that easy, we would have done it already. Complex systems need complicated management and are difficult to sustain." There is a real fear that the revolutionaries are thoughtlessly throwing out the good work of the past—nasty, brutish barbarians destroying the fine artifacts of civilization because they are not understood. This view is mistaken.

What has happened is that over time, hard-working thinkers, inside and outside the Air Force, have progressively built for us a new place to stand and look at our world. Seen from this new perspective, familiar things look very different. New technology and new knowledge about how interdependent processes work have given us capabilities and insights that lead us to radically different solutions, often simpler than the status quo. (To discuss *why* is outside the scope of this paper, but the case is made cogently in the references 2, 3, and 7.)

This paper is based on the premise that the key difficulty facing logisticians today is not concerned with details of data systems constraints, policy barriers, allocation of funds or skilled people, or the rigidity of work force specialization. These are often cited as root causes of lack of progress, but this is only because they are the most visible hurdles to be overcome. The pivotal challenge is to get, and share, a clear focus on the real nature of the business processes we are responsible for managing. We cannot begin to accept and nurture change until we all, or most of us, understand the underlying mechanisms of "why" and "how" work must be done to be really effective. (4)

The purpose of this paper is to present a clear view of Air Force wholesale logistics in terms that will help the reader understand the fundamental scope, structure, and dynamics of our business; and most crucially, the way interdependent processes operate together in one system. This discussion aims to be a jumping off point for further, deeper exploration.

There is a natural tendency to try and fit new information with what is already known and internalized. In the field of logistics, all managers have mastered a wide range of detailed knowledge of the complex interactions of computer systems, policies, and procedures needed to "get the work done." The downside to this expertise is that it forms a mind-set that often finds proposals for radical change to the definition of "what work is needed" both inexplicable and threatening. (1,5)

To help the reader "think out of the box" and put aside the current paradigm, I start from first principles of business analysis and, step-by-step, build up a high-level picture for wholesale logistics. Were I to dig underneath this structure, the component processes would require more and more detailed description. But I hope by starting from a simple and consistent structure, subsequent analysis and decomposition of the processes happening within our logistics system will retain the order and clarity of description needed to ensure effective, radical, and logical process redesign.

The goal here is to formulate an integrated perspective. The enemies to progress are lack of clarity, inconsistency, and sloppy thinking. The first thing we need to get clear in our minds is the fundamental purpose of the wholesale logistics system. This purpose will characterize the nature of our business.

The Nature of Our Business

The following questions and answers describe our business at a fundamental level:

- *What business are we in?* Providing serviceable parts to our customer.
- *Who is our customer?* Anyone who gives us a valid order.
- *What is our critical raw material?* Broken reparable parts.*
- *Who supplies our critical raw material?* Our customer.

We are in a partnership with our customer to fix and ship parts.

* It is true that we also need piece parts as raw material to the repair process, but this input, like machine time and skilled manpower, are not fundamental to the nature of the business at this high level of description—they are enablers. These inputs will be discussed later when we look at supporting processes.

Everything we do must be directed to success in this simple task.**

The Scope of the System - What We Control

In looking at any business, particularly from the inside, there is a strong temptation to confuse interest and influence with real control. As in all businesses, we need to monitor our market and forecast changes in demand and income. We can ask our customers for timely feedback on their plans. We can ask our shareholders for allocation of funds for development of infrastructure, replenishment of material, and some insurance for fluctuations in operating expense. But in terms of improving our "profitability" and ensuring not only survival, but increased security and growth, we must focus our energy on reengineering those processes we have real control over.

When thinking about the boundaries of the wholesale logistics system, it is clear that we control the creation, storage, transportation, and release of serviceable parts to the customer and nothing else (Figure 1).

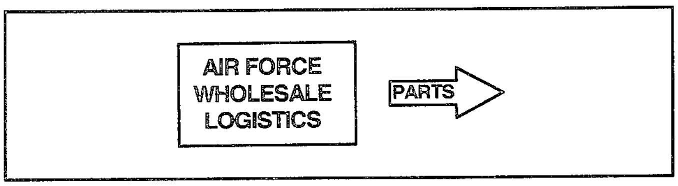

Figure 1. Scope of the Air Force Wholesale Logistics System

The Driving Force of the System - What Adds Value

The nature of the process at the heart of the logistics system is transformation. If we do this well, we add real value. Everything else we do is subordinate to getting this process right. We transform reparable parts from broken into serviceable condition by the application of tools, piece parts, time, and skilled manpower (Figure 2).

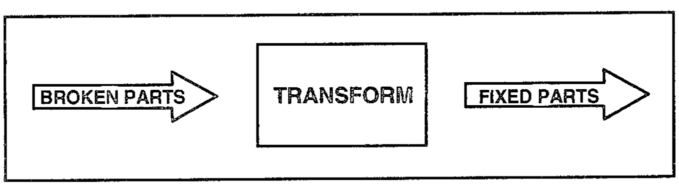

Figure 2. Driving Force of the Air Force Wholesale Logistics System

The Dynamics of the System - Cyclical, Interdependent

What makes our system different from manufacturing, where we can envisage raw materials being brought together in sequence on a production line, assembled, tested and then shipped, is that our production lines depend on return of reparable carcasses from our customers. We manage part of a continuous pipeline in partnership with our customers.

The dynamics of the system is that we sell serviceable parts to our customer. Our customer breaks parts that they then sell back to us. A shortage of broken parts going into the FIX process is as serious as a shortage of fixed parts going into the BREAK process (Figure 3).

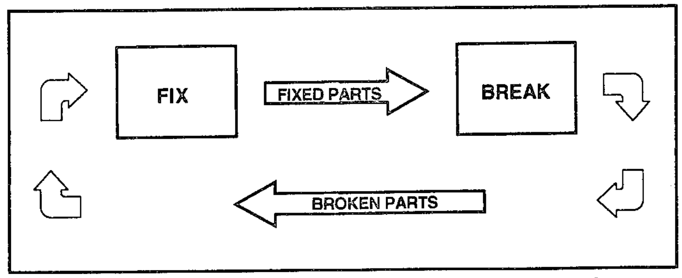

Figure 3. The Dynamics of the Air Force Wholesale Logistics System

The Intermediate Steps in the System - Transform, Transport, Store

Complexity starts to enter the simple system we have described when we consider the realities of physical movement of parts. Between the active FIX and BREAK transformation processes there are TRANSPORT and STORE processes. A large part of the set of computers and people working in the wholesale logistics system today are consumed with the problems of controlling, measuring, and accounting for the movement of parts through these processes. The arrows in Figure 4 represent the TRANSPORT processes.

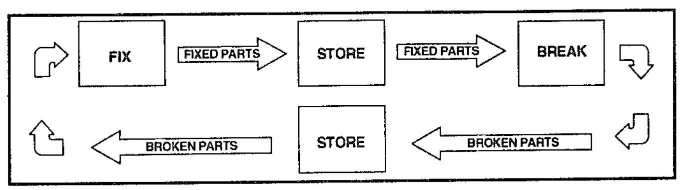

Figure 4. The Intermediate Steps in the Air Force Wholesale Logistics System

All these steps consume time. Time spent is directly related to the number of parts needed in the pipeline to insure against failing to meet customer demand. For this reason we have to have control mechanisms in the system to minimize delays in starting the next step. From a system design point of view, the first fundamental problem is to manage the flow of parts through the pipeline.

Changing Size of System Inventory

Customer demand does not stay the same. Changes in flying rates, failure rates, or simply changes in customer performance in identifying true needs, all contribute to changes in demand. Parts are not always reparable when broken. Sometimes they must be disposed of from the system as irreparable. The second source of complexity in the real system comes from those processes that have been developed to address the problem of how to keep the system inventory sized correctly. Ideally, we need not too many and not too few parts in the pipeline, all the time (Figure 5). From a system design point of view, the second fundamental problem is to manage the replenishment/removal of parts from the pipeline.

** The corollary is that we must stop wasting time, money, and energy on activity that does not make a direct, measurable contribution to continued success in fixing and shipping parts.

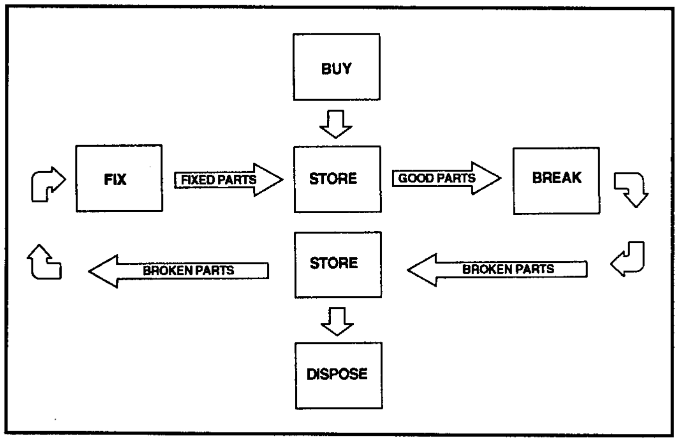

Figure 5. Changing Size of System Inventory

At this point we should pause and reflect on how things are today, and why. Historically we have approached the problems of complexity, variability in flow, and uncertainty in demand by seeking better and better forecasting methods. We have attempted to drive production with comprehensive, long-term forecasts. Unfortunately, because of the natural constraints of batch production, exacerbated by the financial pressure of a quarterly negotiation and the use of "efficiency" based metrics in the production shop, this strategy has simply introduced more variability. We have responded by laying in ever larger stacks of reparable parts at every stage in the process (interestingly, with the exception of the most useful location; a piece parts buffer at the start of the repair process).

In short, reliance on forecasting as the driver of production is ineffective and carries with it the seeds of its own downfall. What we need is a responsive production process that minimizes variability and copes with uncertainty naturally as a consequence of design.

Business Interface with Customer

We have already seen we control only part of a continuous pipeline, in partnership with our customers. The interface with our customers, both for the issue to them of serviceable parts and the receipt from them of our "critical raw material"—reparable parts—is where we can easily confuse interest with real control (Figure 6).

We are concerned with information on failure rates and with information on the time taken to place a demand on the wholesale system after a part is broken in use by the customer. But we do not control these events or activities; they lie inside the part of the system operated by our customers.

Some customer behavior, such as their lack of responsiveness in returning reparable carcasses (our raw material), is influenced by rules set by the Air Force concerning the funds exchange that accompanies the physical transfer of a part from one system to another. These rules, and the resulting behavior, impact our business; but we do not control them. We can simply lobby for the process owner (the Air Force) to make changes that facilitate more effective exchange between systems—to move things faster, to improve quality of information concerning future changes in demand, and, as a consequence, to reduce the level

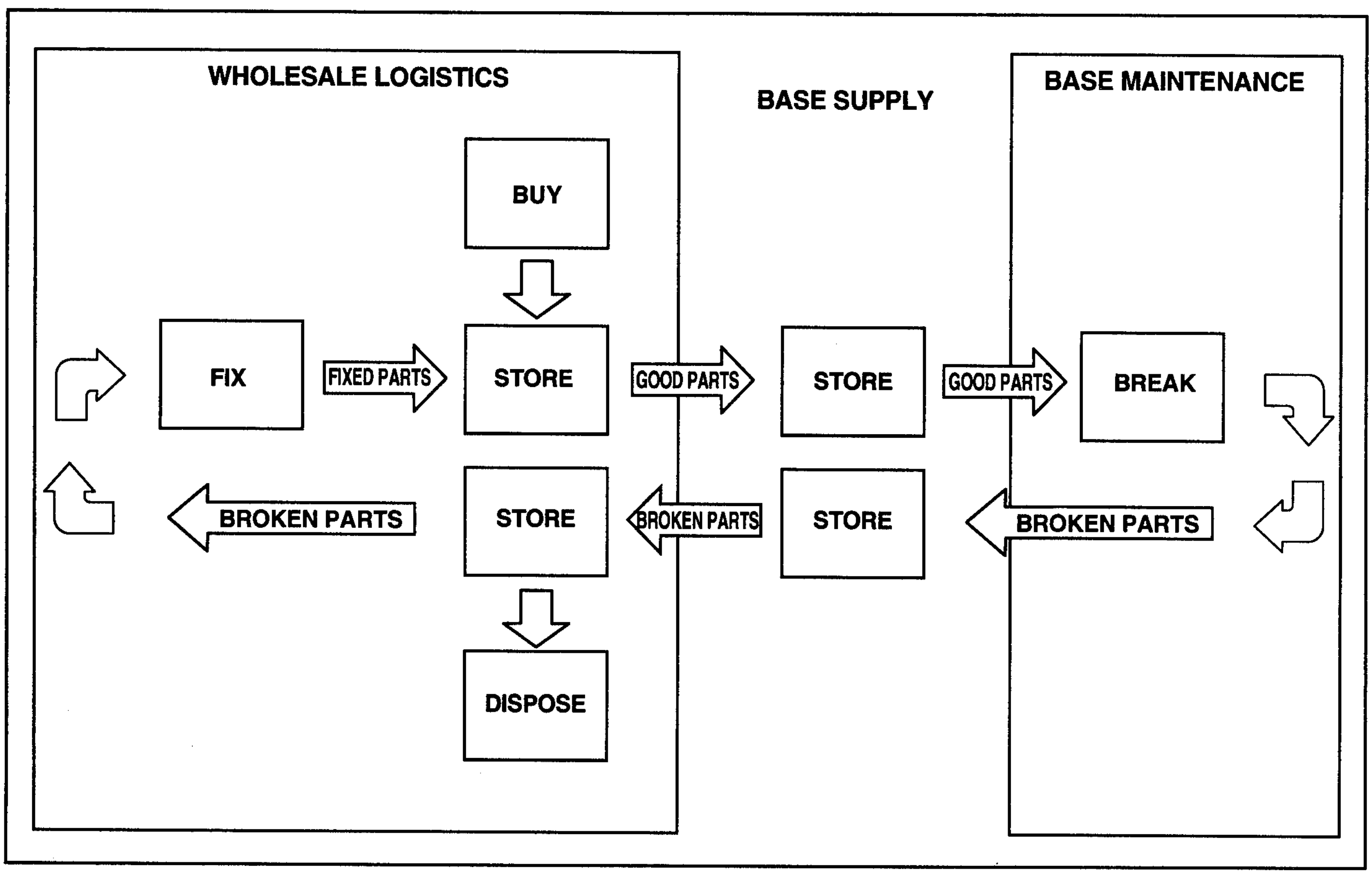

Figure 6. Business Interface with Customer

of investment needed in inventory for both partners; the supplier and the customer.

To make this cycle run smoothly, both partners must cooperate closely and share a clear understanding of responsibilities. Unfortunately, today we can see a serious disconnect between the two partners as a result of two incompatible cultures. The war fighter is focused primarily on effective behavior, at almost any cost. On the other hand, the depot support chain is driven mainly by demands for efficient use of labor and material to keep unit costs down. Both cultures are necessary to some degree, but they need to be brought into balance to ensure the overall goal is not missed; because success in terms of local measures overrides the good of the whole. Clearly, the key to harmonizing the cultures lies in mutually supportive metrics and a better understanding of the interdependence of each part of the support chain. The boundary of our part of the system is not defined by ownership and accountability for parts, it is defined by the events that begin and end the flow of material. That is, the arrival of a valid need from a customer and the issue of a serviceable part to a customer. From a system design point of view, the third fundamental problem is to manage the transactions between the system and the outside environment.

Integration of Processes in the System

So far, we have explored the scope, internal driving force, and dynamics of the Air Force wholesale logistics system. We have discussed the way the system responds to external changes; for example, in changing inventory size to match level of demand. We have described the boundary between the wholesale logistics system and the customer.

The process at the heart of the Air Force wholesale logistics system is the flow of parts into our system, through repair, and out of our system. That is, the change of state from broken to serviceable and the movement required to meet the needs of our customers for serviceable parts in their hands. This is the *core process*.

If we could always mend everything that was broken, if our customers always had the same needs, and if our capabilities and resources never changed, we could imagine achieving a "steady state" in the logistics pipeline. Under these hypothetical conditions, if we could correctly size the inventory once, we would need no other supporting processes.

We could envisage the process as a flow through a pipe of fixed diameter (Figure 7). In the steady state we would simply manage the flow of parts. We would be concerned only with flow velocity.

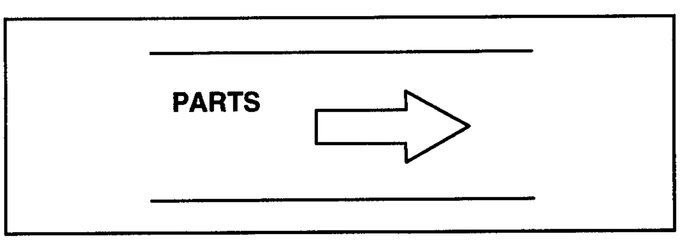

Figure 7. "Steady State" Flow of Parts

Because life (and logistics) is real, changes will happen; there will be variability, and we will need supporting processes to allow our system to respond and adapt to changes. To be responsive, a system must be made up of processes that adapt. The necessary conditions for successful response to change are information, resources, and flexibility. Some of the changes that will occur and the system responses we need are listed in Table 1.

The picture we now have is not a steady state. It is of a pipe that varies in flow capacity, and a flow of parts that varies in volume. Our goal is to manage the changes to flow capacity and the changes to total volume of parts in the system. These changes occur as a result of changing demands on the system, changing level of resources to sustain the system, and changing conditions inside the system (Figure 8).

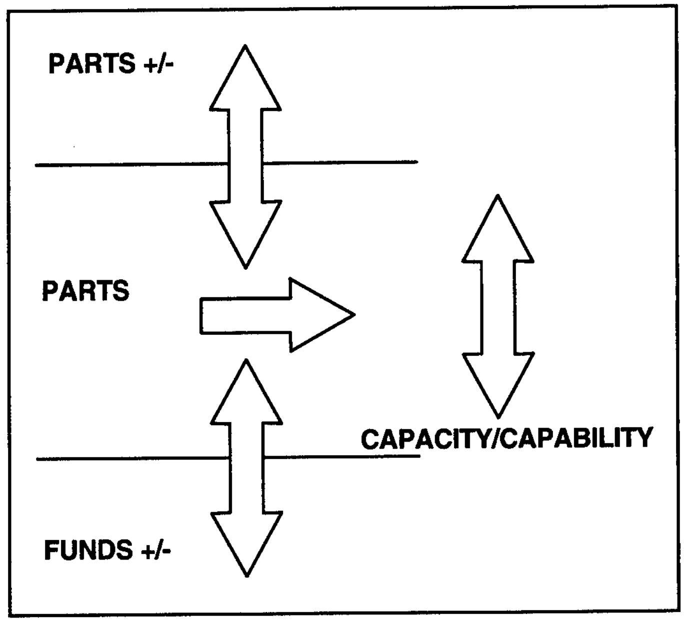

Figure 8. "Varying State" Flow of Parts

The processes that we use to plan and execute the system's response to these changes support the core process of managing the flow of parts through the pipeline.

Supporting Processes

We can group the supporting processes as follows:

Manage the Inventory Size. This process ensures replenishment of the inventory flowing through the pipeline. Buy, Make, Borrow, and Modification processes are the means we use to bring parts into the flow. Condemn and Dispose processes are the means we use to remove parts from the flow.

Manage the Shop. This process ensures maximum system throughput for minimum operating expense and inventory (as defined by Theory of Constraints). (4) Shop configuration, man loading, work force skilling, replenishment of shop stock, and control of jobs flowing through the shop are the subordinate processes.

Manage Funds. This process ensures funds are available where and when needed to permit the flow of parts into and through the system. We can identify three separate interdependent parts of the process:

(1) Acquire - How we get funds into the system.
(2) Inject - How we put/allocate funds into different parts of the system.

(3) Transact - How we trade funds between different parts of the system and with other systems.

Manage the Job. This process ensures work presented to the shop has a defined content, is correctly sequenced, and is controlled as it moves through the production process in a stream of similar and dissimilar jobs competing for resources. The selection of a shop for a particular piece of work when there is more than one source of repair will be part of this process.

Summary

The *core process* of our system is the change of state from broken to serviceable and the movement required to meet the needs of our customers for serviceable parts in their hands. From examining this core process we derive three fundamental challenges that must be met by the design of the wholesale logistics system. The system must successfully manage: (1) flow of parts through the pipeline, (2) replenishment/removal of parts from the pipeline, and (3) transactions between the system and the outside environment.

There are subordinate processes that support the *core* "transformation" *process.* These subordinate processess are concerned with managing: (1) reparable inventory size; (2) shop capability (including the availability of piece parts); (3) funds, and (4) jobs. These processes must be designed to allow the system to respond and adapt to change quickly and effectively.

Conclusion

We are all responsible for thinking critically about the real nature of our business processes, learning what is going on, and then taking action to move closer to our goals. To do this, we must get focused and stay focused. This paper provides a high-level picture of our *core* business *process* that could act as a map for our journey of exploration.

Once we discover what we need to change, nurturing that change is hard work. There are many physical, cultural, emotional, and intellectual barriers to be overcome or worked through. (1) For example, the approach taken here suggests that our business process may be less complex than we are accustomed to thinking it is. This is a serious challenge to our organizational culture, and we must face up to it. People often feel emotionally threatened by any notion that "their" work can be simplified. At first sight it seems to suggest they have been stupid to make things more complicated than they need to be. This understandable fear can be managed and subdued if we take the time to explain the impacts of change in a context people can grasp readily.

One strong argument for change is the outcome of many reengineering projects in private business. This shows that, although processes tend to be greatly simplified, the human role is elevated and enriched as a result. (5) To generate the energy for commitment and progress, we need to relate such positive results in specific terms that people can immediately recognize and buy in to—how it will effect them and their daily work. Understanding will defeat reluctance to change.

So what's new here? Maybe just our point of view. But looking at the world in a new way, and thinking hard about what we are really seeing, is how all significant advances start rolling.

> "They are ill discoverers that think there is no land, when they can see nothing but sea."
>
> Francis Bacon 1561-1626.

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Wing Commander Foster is presently Chief, Business Improvement Branch, Directorate of Logistics, Headquarters Air Force Materiel Command, Wright-Patterson AFB, Ohio.

Change	Response
Broken parts will be condemned and leave the flow	Buy or make replacement parts
Level of need for serviceable parts will change	Resize inventory (buy, make, borrow, or sell)
Stockage effectiveness will change	Resize and reschedule stock replenishment
More flexibility in the work force will occur	Rescope labor standards, job content/sequence—Devise new approaches to compensation
More reliability of parts will be obtained	Resize inventory
More effective repair equipment will be obtained	Rescope shop and job
Funding level will change	Revise budget planning
Costs will change	Revise cost control and budget planning
Prices will change	Revise budget planning
Number of sources of repair will change	Rescope work load share
Work load mix will change	Rescope shop and job

Table 1. Changes and System Responses

AFIT *The Doorway to Logistics Success*

Student research is a key component of the AFIT Graduate School of Logistics and Acquisition Management programs. All students, working either alone or in teams or two, complete a master's thesis. Many of the thesis research efforts are sponsored by agencies throughout the Department of Defense. This issue highlights the superior thesis research efforts produced by the class which graduated in September 1995. A copy of each thesis is available through the Defense Technical Information Center (DTIC), Cameron Station, Alexandria VA 22304-6145, DSN 284-7633.

AFIT Commandant's Award (Most exceptional research contribution to the student's field)

TITLE: *An Investigation of Problems in Analyzing Prices of State-of-the-Art Commercial Items*
AUTHOR: Victoria A. Fry

This research explored whether techniques described in the *Armed Services Pricing Manual* are sufficient for evaluating prices of leading-edge and modified commercial items. The research was sparked by the Federal Acquisition Streamlining Act of 1994 which encourages contracting officers to rely on information other than certified cost or pricing data when buying commercial products. Pricing techniques used in five recent acquisitions were investigated through a case-study methodology. The research concluded that current guidance is sufficiently broad to enable the contracting officer to tailor the tools to an acquisition at hand. Research findings, however, indicated that the Department of Defense should consider expanding guidance and systems for use in secondary and auxiliary price comparisons. Findings indicated that contracting officers may not have the expertise or availability of data necessary to obtain pricing information from the preferred sources ranked in proposed regulations implementing the streamlining act. The research also uncovered evidence of the culture shock that contracting officers will experience as acquisition reforms are implemented. Contracting officers indicated that prices evaluated through price analysis techniques were the best obtainable given the circumstances. They believed that better prices could have been established through analysis of detailed cost or pricing data.

Leslie M. Norton Pride in Excellence Award (Outstanding quality) - four 1995S recipients

TITLE: *An Investigation of Problems in Analyzing Prices of State-of-the-Art Commercial Items*
AUTHOR: Victoria A. Fry (See AFIT Commandant's Award)

TITLE: *Measuring Behaviors of Air Force Officers and Indicators of Effective Performance and Leadership*
AUTHOR: Captain Linda S. Hurry

It is clear that the officer corps will play a key role in improving the Air Force's efficiency, preserving its traditions, and ensuring it maintains the highest level of combat capability. Yet, surprisingly, there is little agreement about exactly which types of officer performance contribute the most to meeting the Air Force's objectives. Performance requirements for officers have not been defined in terms specific enough to guide training course development and performance evaluations. This study identified the types of performance behaviors Air Force supervisors view as most important for effective officership. It also tested a model of individual officer effectiveness which proposed that four distinct types of performance—leadership, task performance, interpersonal facilitation, and job dedication—each contribute independently and significantly to overall performance. Policy capturing analysis supported the model. The analysis also showed rated officers, engineers/analysts, and support officers agree about the relative importance of leadership, task performance, interpersonal facilitation, and job dedication regardless of their Air Force job category. Results also showed that commissioning source, race, and sex of the rater do not influence the rating policies, but the grade of the officer does. Implications for Air Force commissioning-source training programs are discussed.

TITLE: *Defense Logistics Agency's Requirements*
AUTHORS: Captains Harry A. Berry and Edward E. Tatge

This thesis discusses the appropriateness of the Defense Logistics Agency's (DLA) requirements model in managing consumable support for Air Force specific items. Currently, DLA uses a lot sizing technique referred to as the classic Economic Order Quantity (EOQ) model. One of the key assumptions of this model is that demand is constant and continuous. Yet, with Air Force bases using a lot sizing technique to place their demands for consumable items to DLA, it is apparent that the demand pattern that DLA faces, at least for Air Force specific items, is not constant and continuous. This study looks at the impact of violations of the constant and continuous demand assumption on DLA's ability to support its customers. The findings of this study highlight the fact that the EOQ model does not perform well

under the lumpy demand patterns that DLA faces. In addition, the Silver-Meal algorithm was used as a comparison to see if other inventory models could better handle this lumpy demand pattern. The Silver-Meal model required less inventory on hand and at a lower total variable cost than the EOQ model DLA is currently using.

TITLE: *Flight Line Maintenance Technicians*
AUTHORS: Captains David A. Chapman and James R. Simmons

Interactive Electronic Technical Manuals will soon become a requirement for aircraft maintenance technicians. An important aspect in their development is the selection of an input device that will enhance, rather than impede, technician performance. The purpose of this thesis was to evaluate two types of input devices that can be used: a voice recognition input and a keypad input. Studies to date have evaluated the superiority of digital data over paper data and advantages of using a head-mounted display device over a flat screen laptop computer. No research has evaluated the input device. An experiment was conducted to determine which interface allowed the technicians to work faster. Sixteen F-16 avionics maintenance technicians from the 178th Tactical Fighter Group, Ohio Air National Guard, performed two parallel tasks using each input device. One task was performed using a keypad input device and another task was performed using a voice recognition input device. Raw data showed no statistical difference in task completion times between input devices. However, when computer processing time was subtracted from the voice task times, there was a slight time difference found. Most importantly, results indicate that the technicians liked the advantages of the voice recognition input device over the keypad input device. The primary conclusion is that voice recognition may be a desirable input configuration and further study is warranted in more stringent environmental conditions.

National Contract Management Association (NCMA) Award (Significant contribution to contract management techniques)

TITLE: *An Investigation of Problems in Analyzing Prices of State-of-the-Art Commercial Items*
AUTHOR: Victoria A. Fry (See AFIT Commandant's Award)

Project Management Institute Thesis Award (Clear understanding and command of project management techniques)

TITLE: *Completion Methods*
AUTHOR: Captain Todd D. Nystrom

Controlling costs in the acquisition of new defense systems is a major challenge in today's environment of declining budgets and rapidly changing technology. One of the challenges faced by program managers and cost analysts is selecting the most appropriate Estimate at Completion (EAC) method for their program. This study compares the performance of the popular index-based EAC methods with several newer nonlinear regression-based EAC methods to determine whether the complex nonlinear methods perform better than the simpler index-based methods. In addition, the sensitivity of the results to stage of contract completion, system type, program phase, contract type, Department of Defense service component, and inflation effects are also investigated. Eighty-eight contracts were examined in this study, and it was found that, overall, the index-based EAC methods performed significantly better than the nonlinear regression-based methods as measured by two criteria; the accuracy and stability of the EACs. In addition, the top performing method overall was determined to be the index-based method using the Composite Index ($0.2SPI_{cum}+0.8CPI_{cum}$). The best performing method was, however, sensitive to all of the factors investigated in the sensitivity analysis.

Society of Cost Estimating and Analysis Award (Significant contribution to cost analysis, cost estimating, or contract pricing techniques)

TITLE: *Frequency As Seen by the Financial Analyst*
AUTHOR: Captain Diana E. Pry

This research studied the application of cost management competencies in the financial management career field. The purpose was to determine how frequently these competencies are used by the financial analysts and how important they are in the analysts' work environment. To accomplish this research, a mail survey was sent to 978 financial analysts across Air Force Materiel Command. Out of the 978 survey instruments sent, 535 were returned with useful data, for a response rate of 54.7%. From these surveys, 24 of the 49 competencies were identified as being valuable to financial analysts. The 24 competencies provide a framework for future education of the financial analysts. Additionally, 19 of the 24 competencies require education to the comprehension level of learning. Only five of the 24 most valuable competencies required achievement of an application level of learning. This result may provide insight for course directors faced with the challenge of appropriately structuring cost analysis courses.

The Graduate School of Logistics and Acquisition Management invites suggestions and topics for thesis research in its Master of Science (MS) programs. Specific areas covered by these programs include logistics management, acquisition logistics management, supply management, transportation management, systems management, contracting management, cost analysis, software systems management, and information resource management. If you have a thesis topic to suggest, please first contact a faculty member to discuss the topic. Any faculty member may be reached by calling DSN 785-7777, extension 3300, or commercial (513) 255-7777, extension 3300. Thesis research topic proposals should be submitted to Dr D. Kirk Vaughan, Assistant Dean for Research and Consulting, AFIT/LAC, 2950 P Street, Bldg 641, Wright-Patterson AFB OH 45433-7765. For a copy of the *Call for Theses* which details the thesis topic suggestion process, please contact Dr Vaughan at DSN 785-7777, extension 3312.

Air Force Wholesale Ammunition Management by the Single Manager for Conventional Ammunition

Captain David J. Rega, USAF

Introduction

Prior to the mid-1970s, the Department of Defense (DOD) allowed individual Services to manage their own conventional ammunition stockpiles during peacetime. But during World War II, the Korean War, and the Vietnam War, the DOD centralized management of conventional ammunition to fulfill wartime tasking more efficiently. After the Vietnam War, the DOD decided it was a mistake to wait until there was a conflict to begin centrally managing ammunition. Therefore, in March 1975, the DOD directed the Department of the Army to develop a centralized ammunition management agency for all Services. The resulting organization, the Single Manager for Conventional Ammunition (SMCA), was fully implemented as part of Army Material Command in fiscal year 1977. (12:1) The SMCA's responsibilities include the storage, maintenance, and inventory management of close to 600,000 short tons of Air Force ammunition (Figure 1) at locations throughout the CONUS (Figure 2). For this reason, it is imperative for Air Force logisticians to understand how the SMCA operates. This article will review SMCA formation, operations, and plans for the future.

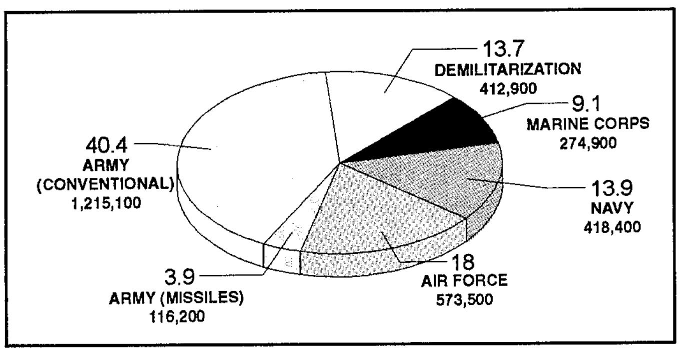

Figure 1. Single Manager for Conventional Ammunition Wholesale Ammunition Storage Base (3:7)

The Past

During past conflicts, the DOD centralized management of conventional ammunition to fulfill wartime tasking more efficiently. The centralization of ammunition management differed from the peacetime system of ammunition management. The DOD allowed individual Services to manage their own conventional ammunition stockpiles in peacetime. The Services were able to retain the autonomy and, therefore, maintain the prerogatives they desired. (12:8-9)

However, the idea of centralized management of ammunition during peacetime continued to be debated. Experience from the Vietnam War revealed a desperate need for centralized management of ammunition at all times; wartime or peacetime. By the late 1960s, ammunition production plants were not well maintained, delays in production were frequent, and there was much duplication of effort among the Services. (11:1)

In 1968, the DOD tasked the Logistics Management Institute (LMI) to develop a plan for updating ammunition production facilities. Two years later, LMI recommended that improved coordination between the Services would increase efficiency and reduce duplication among the Services' production facilities. By 1973, the DOD tasked the Services to develop a coordination plan for management of the defense production base. (1:6) This tasking led to the formation of the Joint Conventional Ammunition Production (JCAP) coordinating group. The mission of the JCAP coordinating group was to coordinate and upgrade the management of the ammunition production base. However, many inefficiencies continued to hamper the means by which the Services managed their ammunition, necessitating another change to the management of ammunition. (11:2)

In December 1973, the Government Accounting Office (GAO) issued a report recommending the centralization of all ammunition activities into one organization. By 1975, the DOD had established the Single Manager for Conventional Ammunition to be managed by the Department of the Army. In October 1977, the SMCA became operational. (2:4-8)

Its mission was to:

(1) Integrate conventional ammunition logistics functions of the military departments to the maximum extent practicable, thereby eliminating unwarranted overlap and duplication.

(2) Achieve the highest possible degree of efficiency and effectiveness in the DOD operations required to provide top quality conventional ammunition to US Armed Forces during peacetime and mobilization.

(3) Maintain an integrated production and logistic base to meet peacetime, surge, and mobilization requirements for assigned ammunition. (5:1-2)

Implementation of centralized management for DOD ammunition was now complete. However, implementation did not mean that all the problems associated with the prior management of ammunition were solved.

In 1979, the GAO issued a report titled "Centralized Ammunition Management—A Goal Not Yet Achieved." The report noted that progress was being made toward the centralization of ammunition management. However, the GAO believed more needed to be done. Recommendations included placing the SMCA at a higher level in the DOD organization and

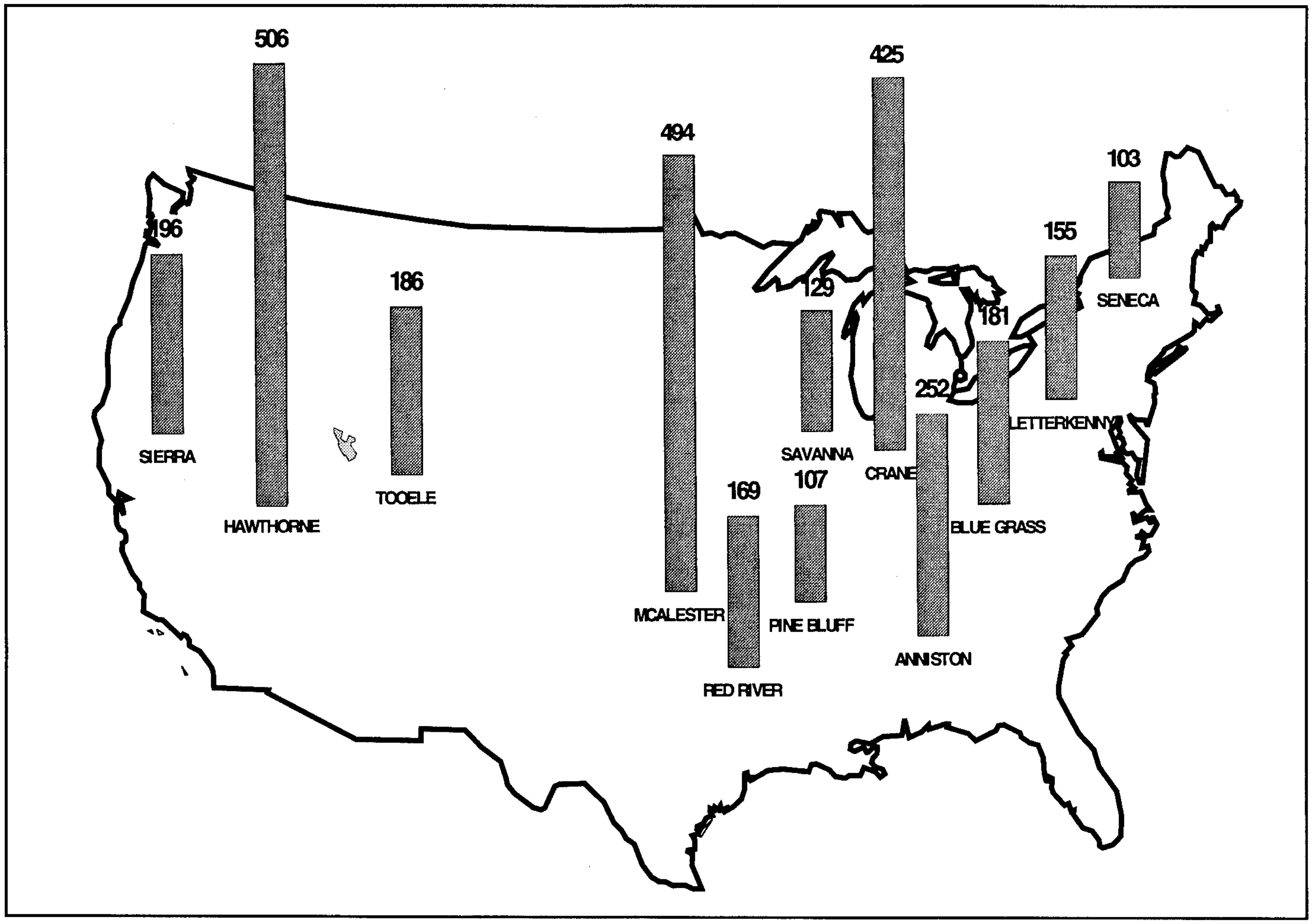

Figure 2. Army's Primary Wholesale Ammunition Storage Installations (3:7)

giving it the necessary control over all conventional ammunition items. Additionally, other areas requiring further attention included management of facility and procurement programs, accountability of ammunition inventories, and the transitioning of Service-owned conventional ammunition items to the SMCA. (13:5)

The DOD agreed only in part with these recommendations and never fully implemented the requested changes. Recommendations not fully implemented included placement of the SMCA in the Army chain of command. The GAO proposed to have the SMCA report directly to the Secretary of the Army while the Services agreed to have the SMCA report to the Development and Readiness Command (DARCOM) commander. Another recommendation pertained to the amount of Service control over certain ammunition items. The GAO proposed SMCA control all ammunition, while the Services wanted to retain control over certain ammunition items and, in some cases, have an input to production facility decisions. (13:5) Reasons for continued control were increased visibility and flexibility of these Service-specific items.

Additionally, the non-Army Services had reservations about losing control over retail stocks (items individual Services own and store themselves). Field operating commanders believed losing control of these stocks to the SMCA would directly impact their war-fighting capabilities by allowing an organization outside their Service to decide how the commander's ammunition would be managed. (10) These reservations were strong enough to limit the Congressionally-suggested change of centralized management of all ammunition items.

An important aspect of the single manager concept is inventory accountability of the stockpile. The SMCA was established to provide efficiencies to the management of DOD ammunition. However, as the Congressional and GAO reports state, the SMCA has had problems in the past maintaining and accounting for the ammunition it stores. Many of the problems persist.

Two large studies completed in the last two years—the Red Team and the Wholesale Ammunition Stockpile Program (WASP)—provided an in-depth evaluation of how the SMCA currently operates. The Army initiated the Red Team in December 1992 to address mission impacts on the ammunition stockpile resulting from funding shortfalls. The specific purpose of the team was to find ways to reduce cost of managing ammunition by standardizing as many depot receipt, storage, and issue processes as possible. (9:2)

The Red Team inspected six Army depots. Though the team found many internal inefficiencies the depots were responsible for, such as duplication of previous inspections and misrouted shipments, little significant financial savings resulted. However, the team found the largest problem for the depots was the retrograde (or return) of ammunition from overseas. This

retrograde greatly affected the depot's financial situation. Unfortunately, the SMCA had, and still has, little control over what happens externally. This limited external control can result in the SMCA's being forced to accept unforecasted shipments, thereby reducing limited funds programmed specifically for forecasted shipments.

Items coming back from overseas after the Gulf War were often received with improper condition codes, incorrect markings, and in mixed lots. Additionally, the volume of ammunition coming into the depots was much greater than the normal volumes the depots were capable of receiving. The outcome was an inability to inspect and assign permanent condition codes for all items prior to storage. Consequently, the SMCA's inventory problems were significantly increased by the retrograde of overseas units.

Though the military Services and the SMCA knew the large overseas retrograde would be difficult for the Army depots to process and store correctly, the Services had little choice but to send overage ammunition back to the US. This retrograde was due partly to the base closure situation in Europe. Compounding this problem was a round of base closures in the US that threatened to close or restrict the use of the few remaining Army depots. An additional hurdle for the depots was that many were reaching their covered storage capacity limits.

The large amount of overage ammunition being sent to overtasked depots, without the proper paperwork, was the main reason for the Services to be apprehensive about the storage of wholesale ammunition. This apprehension resulted in the formation of the WASP, or Wholesale Ammunition Stockpile Program, in May 1993. The WASP was formally tasked to review the condition of the stockpile within the SMCA storage base. (10:ES-1)

The WASP conducted visits to three installations during July and August of 1993. Overseas retrograde, amount of unserviceable material in storage, and fragmented lots were just a few of the many selection criteria used by the WASP to select the three specific depots. To further clarify potential readiness, quality, and safety issues, the WASP requested and received from each Service a Top 20 list of items the Services deemed most in need of inspection from a readiness/safety standpoint. The status of the TOP 20 list became the focus of the WASP.

What the WASP found during their evaluation of the three installations was no surprise given the number of hurdles the SMCA had faced over the previous two years. The accuracy of the inventory posture was 13% below standards. Data indicated that accountability would continue to degradate if funding levels of depot operations continued as forecasted. In the future, "it will be difficult to know what we have, where it is located, and what condition it is in." (10:ES-17)

The depots were found to be almost at covered storage capacity. The WASP estimated the overall depot storage capacity would be breached by the end of fiscal year 1995 (FY 95). If any items are shipped to a full depot, the depot will store the items outside. This exposure to the weather drastically increases the amount of degradation each item would undergo, resulting in increased future maintenance and the wasting of valuable assets.

The Present

The two aspects of SMCA management that most affect current Air Force-related SMCA operations are the depot work load forecast and the tiering program for realignment of Army ammunition depots. Each Service provides a forecast to the SMCA detailing items that are expected to be shipped into and out of each Army ammunition depot during the upcoming fiscal year. This forecast is a mechanism used by the Army to establish funding levels for each of the depots. Once the overall funding levels are determined for each Service, the Services must then remain within the confines of their forecast insofar as how many items each Service can ship into or out of the Army ammunition depots.

For FY 95, the Air Force forecasted to move 177,000 short tons of Air Force items into and out of the Army depots (referred to as receipts and issues). These forecasted requirements were completely met. The receipts and issues were from the continental United States (CONUS), United States Air Forces in Europe (USAFE), Pacific Air Forces (PACAF), and any other area that had an allocation for an item stored at an Army depot.

The Air Force forecast for FY 96 is for 174,000 short tons. As of mid-January 1996, the Air Force is well below first quarter projections. However, if the Air Force exceeds the year's forecasted limit, additional funding will be required. Without additional funding, items over the forecasted amount will not be shipped out and accepted into the Army depots.

The other aspect of SMCA management that affects Air Force-related SMCA operations is the tiering program under development by the SMCA. The WASP summarized that sustainability of stored items was declining, as were inventory accountability and stockpile confidence. The WASP predicted that readiness would continue to decline if inventory and storage problems persisted. Recommendations included the rewarehousing of stored items using an automated Storage Space Utilization program. (10:ES-23) This rewarehousing suggestion helped lead the Army to the development of the Integrated Ammunition Stockpile Management Plan, or tiering plan.

The Integrated Ammunition Stockpile Management program provides a methodology for restructuring the current wholesale ammunition storage base for all Services. The plan also addresses changes in stockpile management methodologies for distribution, storage, inventory, surveillance, maintenance, and demilitarization. As a result of the changing world political environment, force reductions, and decreased funding, streamlining the storage base into an efficient and effective operation has become imperative to maintaining a high level of readiness. (3:1-3)

The final objective is to have a smaller, safer stockpile on fewer installations, using less manpower. The method of accomplishing the final objective is to create a tiering system based on the Army's eleven primary wholesale stockpile storage installations . The tiering system is segregated into three levels:

Tier I Active Core Depots. Normal activities include daily receipts/issues of training stocks, storage of war reserve stocks required in contingency operations [contingency start date plus

30 days (<C+30)], and additional (follow-on) war reserve stocks (>C+30) to augment lower-level tier installation power projection capabilities.

Tier II Cadre Depots. Tier II will normally be utilized to perform static storage of follow-on war reserve requirements, store production offset stocks, and limited nonrequired demilitarization stocks. Daily activities will be minimal for receipt/issues, while work load will be primarily focused onmaintenance, surveillance, inventory, and demilitarization.

Tier III Caretaker Depots. These installations will be minimally staffed and will contain static nonrequired stocks in static storage until disposition can be made. (3:11-12)

A tier depot analysis was performed February through March 1994 to identify and assign appropriate tier levels for each of the eleven primary storage installations. This qualitative and quantitative analysis coupled with the necessity of meeting power projection requirements of the two Major Regional Conflicts (MRCs), as outlined in Defense Planning Guidance, resulted in the realignment of the CONUS wholesale storage infrastructure in Table 1. (3:13-15)

- West Region
  - — Tooele Army Depot - Tier I
  - — Hawthorne Army Ammunition Plant - Tier II
  - — Sierra Army Depot - Tier III
- Central Region
  - — McAlester Army Ammunition Plant - Tier I
  - — Red River Army Depot - Tier II
  - — Savanna Army Depot Activity - Tier III
- East Region
  - — Crane Army Ammunition Activity - Tier I
  - — Blue Grass Army Depot - Tier I
  - — Letterkenny Army Depot - Tier II
  - — Anniston Army Depot - Tier II
  - — Seneca Army Depot Activity - Tier III

Table 1. Regional Depots Per Tiering Plan

The Future

The Army is still developing and streamlining the Integrated Ammunition Stockpile Management Plan. The plan's tiering system will affect the Air Force wholesale stockpile. Optimistically, the tiering system will clear from the depots much useless material such as the large backlog of items awaiting demilitarization, thereby freeing up needed covered storage space. Additionally, high-priority war reserve stocks will be more accessible and better maintained. Power projections for the two MRCs will be met.

Many wonder how the Army will be able to fund this program. The required funding needed to implement the entire tiering plan is $206 million of operations and maintenance (O&M) money above the normal requirements for fiscal years 96-98. Though this investment is anticipated to save $56.5 million in FY 99 and $70 million per year cost avoidance in FY 99 and beyond, many experts fear that if the tiering program is not fully completed, the state of wholesale ammunition may end up in worse condition than it currently is in.

Another fear some experts have is whether the depots under the tiering system will be able to meet outload requirements for two MRCs. The tiering system is designed to focus the outload of ammunition during wartime scenarios to Tier I depots for <C+30 requirements. Experience during Operation Desert Storm identified a problem of trying to move too much out of all the Army depots at once. Under the tiering system, ammunition will initially be outloaded from only the Tier I depot that is aligned with that particular MRC. For instance, if the Air Force needed to ship war reserve items to PACAF, the Tier I depot on the West coast (Tooele) would have to ship out **all** Air Force <C+30 ammunition. That is a task many believe is not possible.

Summary

Ammunition management is a topic that has been discussed at length for many years. However, it was not until the Vietnam War that the DOD pushed the Services to develop a peacetime centralized management plan for conventional ammunition. The resulting organization, the Single Manager for Conventional Ammunition (SMCA), was established in 1977. Over the last 17 years, the SMCA has been refined to better serve the needs of the Services. Though problems with inventory accountability and maintainability remain, the Air Force continues to work with the SMCA to develop and streamline how wholesale ammunition is stored. The goal is to offer a better product and more services to the units in the field who are the end customers.

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Increase in Expense/Investment Threshold

Congress rejected the Department of Defense's (DOD's) request to eliminate the expense/investment threshold effective with enactment of the fiscal year (FY) 96 DOD Appropriation Bill. Instead, they opted to increase the threshold from $50,000 to $100,000. Accordingly, Air Force major commands and field operating agencies are reminded the investment threshold for the three active years (FYs 94, 95, and 96) of Other Procurement (3080) funds is $25,000 for FY 94, $50,000 for FY 95, and $100,000 for FY 96. Funds previously transferred from 3080 to the Operations and Maintenance (O&M) appropriation for FY 97-01 remain in O&M as it is the Office of the Secretary of Defense's intent to again request elimination of the threshold as part of the FY 97 President's Budget request. (Maj Bill Goad, HQ USAF/LGSR, DSN 225-7749)

Standard Transportation Industry Information Processor (I2P)

As the Air Force moves from an inventory-based to a transportation-based logistics system, shippers are increasingly turning to express transportation to provide the velocity and reduced variability necessary to offset leaner inventory and maintenance support. Until now, the process for consigning express shipments has involved a cumbersome series of manual data entries into both shipper and carrier automated systems. That will change in 1996, as Cargo Movement Operations System (CMOS) sites in the continental United States begin using the Standard Transportation Industry Information Processor (I2P). I2P is a software enhancement that will integrate CMOS with express carrier automated systems, enabling users to directly request Federal Express, United Parcel Service, and Emery domestic express service from their CMOS terminals.

I2P makes processing express shipments simpler and faster. Control and carrier modules within CMOS will electronically exchange key shipment data to accomplish routing and produce end-of-day manifests, notional cost data, and a standard industry shipping label. This seamless, single-step processing eliminates duplicate data entries, reducing both processing time and manually-induced data errors. Additionally, I2P produces a breakthrough industry standard shipping label that is accepted by both the Defense Transportation System and participating express carriers.

I2P has already been proven in an operational environment. Prototype tests at Eglin and Shaw AFBs confirmed both the system's technical feasibility and process enhancements. In fact, users at Eglin experienced a 46% reduction in express shipment processing time. In addition to faster processing, users at both Eglin and Shaw reported significant improvements in data accuracy and ease of use compared with previous methods of processing express shipments. Following the release of CMOS version 3.3 in July, 1996, I2P enhancements will be phased in over a three-month period at all domestic CMOS sites.

I2P's future is not limited to domestic USAF CMOS sites and express carriers. With the selection of CMOS as the migration system for Transportation Management Offices/Installation Transportation Offices (TMOs/ITOs), other Services will inherit CMOS as well. Other future plans include capability for international express shipments, surface traffic modes, express mail, and adaptation to other systems such as Defense Logistics Agency's Distribution Standard System. Finally, I2P is also a potential springboard for paperless shipping processes to include electronic customs clearance, electronic billing, and inbound logistics. (Capt Tom Butler, HQ USAF/LGTR, DSN 693-9836)

Integrated Deployment System (IDS)

Wing-level deployment operations typically have remained "stovepiped" along functional lines requiring reentry of deployment data, labor intensive quality control, and excessive communications requirements (telephones, radios, runners). IDS is a breakthrough solution to this ongoing problem. IDS is an automated information system tailored to the Air Force wing deployment process that integrates five deployment systems from distinct functional areas: Logistics Plans (Logistics Module - Base Level [LOGMOD-B]), Manpower/Personnel (Manpower Personnel - Base Level [MANPER-B]), Unit Deployment Management (Deployment Management System [DeMS], formerly Automated Mobility Processing System [AMPS]), and Transportation (Cargo Movement Operations System [CMOS] and Computer Aided Load Manifesting System [CALM]). IDS provides for single data entry at the source, improving data accuracy and velocity of information transfer, and streamlines wing communications and deployment execution data to higher-level command and control systems. Although incremental improvement to functionality exists by tying these component systems together by disk transfer, the real benefits are gained when the systems are tied together over a base-wide local area network (LAN).

IDS provides several key benefits to the wing-level deployment process. It replaces all hard copy Deployment Requirements Manning Documents (DRMDs) and hard copy material lists with electronic data flows. This system provides an automated means of managing the wing deployment database and a capacity to manage deployment schedules of events in a real time, electronic format. Finally, it creates cargo and passenger manifests within minutes, while Military Standard Transportation and Movement Procedures (MILSTAMP) compliance is guaranteed by system checks.

IDS was initially installed at Hurlburt Field 7 September 1995. Future installations will follow a training concept and implementation schedule developed by major command (MAJCOM) and IDS component system program management office representatives in conjunction with the HQ USAF IDS Integrated Process Team. Full operational capability for IDS is scheduled for FY 98. (Capt Stephen Strom, HQ USAF/LGTR, DSN 697-7332)

DOD Reengineering Transportation Effort

Starting this past summer, the DOD transportation community embarked on a top to bottom effort to reengineer our transportation processes. The Deputy Secretary of Defense initiated this effort in concert with current efforts to reengineer routine peacetime transportation processes and the movement of household goods.

The reengineering process is built around a series of task forces led by the Office of the Assistant Deputy Undersecretary of Defense for Transportation Policy (OADUSD/TP). These task forces include representatives from the DOD, the Joint Staff, United States Transportation Command, all the Services, the Secretary of the Air Force Offices of Financial Management and Acquisition, and the Defense Logistics Agency. There are four key areas being studied, including the development of a transportation vision, assessments of transportation acquisition and financial management, and an overall assessment of transportation structure and processes. Some progress is already being made with the first three task forces currently meeting. The fourth task force on structure and processes is scheduled to meet after the work on the other areas is completed. The entire effort is expected to last until late in 1996.

The Vision task force recently completed its work on a DOD transportation vision. Their product calls for a Defense Transportation Vision that reads as follows: **"A world class, globally capable, intermodal transportation system that is responsive, efficient, fully integrated, and in partnership with industry - ensuring readiness, sustainability and quality of life."** This vision cuts across the spectrum of transportation related activities including areas essential to the USAF portion of the system and articulates the concepts we must adopt for future successful mission accomplishment.

Results of this effort will have a far-reaching impact on the DOD transportation system and many of the processes that we have as Air Force transporters and logisticians. We will keep you apprised of this effort and work the changes generated by this process with you as they occur. (Lt Col Jeff Ackerson, HQ USAF/LGTR, DSN 227-7335)

Transporters Lead the Way in Lean Logistics

Lean Logistics is an Air Force program that includes a number of complementary initiatives, all focused toward improving operational capability. The prime objective is to **maximize operational capability** by using high velocity, just-in-time parcel service to move parts from bases to repair depots. While the cost of some shipments is higher than previous shipping modes (less than truck load (LTL) shipments), overall logistics costs is actually reduced. When you consider how much we can save by not having to purchase as many expensive "black boxes," the added transportation cost is relatively very small. In effect, we have leveraged the tremendous capability of the commercial express carrier industry to provide the same level of support to the war fighter with fewer parts in the system thus, a savings to the Air Force.

As we move forward in Lean Logistics, transporters will continue to be the key. The overarching theme of transportation support is door-to-door delivery. All of our past initiatives, Return and Repair Packaging, Mail-like Matter Movement, and the Industry Information Processor were geared to improve the movement from the base to repair and back. Our most important next step is the continued development of concepts that provide the same highly-reliable peacetime service in wartime. (Lt Col Gary Melchor, HQ USAF/LGTR, DSN 223-9836)

(Continued from page 11)

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C-5 Lean Logistics Demonstration: Phase I

Captain William H. Surrey, USAF
Senior Master Sergeant Andy Honious, USAF

Now that the final report for Phase I of the C-5 Lean Logistics demonstration has been published, it is time to reflect on where we were and where we are going.

Lean Logistics

Time is the enemy of logistics. Each day of delayed response to the user represents millions of dollars in inventories waiting to be moved, repaired, delivered, stored, and used. Today's logistics environment struggles with long flow times, a just-in-case inventory philosophy, and maldistribution of inventory resulting in extensive use of Readiness Spares Package (RSP) withdrawals, lateral support, and cannibalizations.

Reducing the cost and "footprint" of logistics is the key to meeting fiscal targets and providing a visibility of assets in the system. With the reduction in force structure and continued peacetime logistics work load, it is essential that methods, procedures, and policies minimize the structural overhead of logistics.

Lean Logistics is a concept of operation. It is a management tool that measures the pipeline, processing, repairing, and handling of an Air Force asset. It includes fast repair, fast transportation, fast procurement, and fast processing. Benefits from Lean Logistics, as a minimum, should include improved contractual arrangements, decreased inventory, improved materiel support, and changed philosophy of operations from "just-in-case" to "just-in-time."

The driving idea behind Lean Logistics, as RAND Corporation expressed and Air Mobility Command (AMC) agreed with, is to take best and emerging business practices and emulate them. This demonstration was designed to prove customer support can improve with reduction of inventory and use of express transportation. Lean Logistics is a focused project to integrate state-of-the-art business practices across logistics. Results should be smaller inventories, smaller infrastructure, and less costly weapon system support to operational users in peace and war.

The goal of Lean Logistics is to create a reactive logistics environment throughout the Air Force and provide maximum war fighting capabilities using available resources. Lean Logistics should enhance or maintain mission capabilities at required levels and with less overall consumption of critical resources such as money, people, and transportation. We must focus on the "big picture" incorporating many aspects crossing multiple processes, such as the periodic depot maintenance (PDM) process, depot level repairs (DLRs), supportability of bits and pieces, education and training, and so forth.

Implementation of Lean Logistics is not optional in this day of budget and personnel cuts. Air Force Materiel Command (AFMC) reengineering, for instance, will result in the loss of 37,000 employees, cutting across all major commands (MAJCOMs) and many weapon systems. Lessons learned and improved processes must be documented and shared across the Air Force as building blocks for the future of Lean Logistics.

Initial Demonstration

Headquarters AMC was tasked to conduct the initial test of the Lean Logistics concept. The demonstration was designed to improve support to the C-5 fleet with a reduced infrastructure. Phase I of this demonstration ran from 1 May through 30 September 1994.

The C-5 demonstration involved 24 recoverable assets from various aircraft subsystems. Headquarters AMC operated a Command Supply Center (CSC) at Scott AFB, Illinois, which managed and directed shipments of serviceable inventory for the 24 assets from the Consolidated Storage Facility (CSF) at Dover AFB, Delaware. The CSF, in turn, obtained stock replenishment from the appropriate AFMC depots. Before the test began, AMC determined lean stock levels for each item at each base and designated the appropriate stock level for the CSF.

The C-5 demonstration was not designed specifically to reduce stock levels, increase aircraft availability, or streamline the depot repair process, but to concentrate on the handling processes. In doing this, we were able to maintain support to the C-5 fleet at the same time reducing support infrastructure. The primary goal of the C-5 Lean Logistics demonstration was the development of the first three of six Lean Logistics thrusts presented in the RAND model:

(1) Empowering the command.
(2) Reducing the pipeline.
(3) Streamlining base repair processes and accelerating depot repair processes.

Empowering the Command

RAND's intent was to give the commands more control over the logistics processes which directly affect weapon system readiness and sustainability. The AMC C-5 demonstration tested the following premises of empowering the command:

(1) Command established stock levels.
(2) Centralization of assets under major command control.
(3) Control of serviceable assets distribution.

Command Established Stock Levels

During Phase I, "lean levels" were established at the six C-5 bases: Travis AFB, CA; Dover AFB, DE; Altus AFB, OK; Kelly AFB, TX; Westover AFB, MA; and Stewart ANGB, NY. These levels were computed using the Standard Base Supply System

(SBSS) repair cycle demand level formula with the following constrictions: repair cycle time, normally no less than 6 days by SBSS program control was set at 4 days; NRTS (Not Reparable This Station) cycle time (NCT) was set at 2 days; and the Order and Shipping Time (O&ST) was lowered to 3 days shipping time from the CSF. Normally, O&ST is an average of the time it takes for all requisitions to get from a base to a source of supply (SOS) and for the SOS to ship an item to the base—it does not include any time requests on backorder at the SOS. The normal O&ST for the demonstration items was 17 days. Lean levels were established using command-directed, fixed special levels. This method was the only way to constrain the Repair Cycle Time (RCT) and NCT portion of the formula.

Findings:

- Most base "lean levels" were lower than the normal demand levels.
- Formula used was accurate based on metrics collected.
- Repairs at base and depot levels were hindered by support parts shortages. (Higher levels at the bases would not prevent these problems, just delay them.)
- Calculating lean levels is labor intensive.
- Constraining repair time at the bases to 4 days may not be fair based on DLR funding, does nothing to improve parts support to the base, may be hurting support, and forces a two-level maintenance approach.
- There is a new SBSS discrepancy report associated with fixed levels and rejects. The discrepancy caused multiple problems in automated processing.

Suggested changes:

- Only the O&ST should be constrained when calculating levels.
  — Will allow bases to repair items.
  — Will eliminate reject problem associated with fixed levels.
  — Will allow actual consumption data to be reflected automatically in demand levels.

Centralization of Assets Under Major Command Control

In Phase I, assets were centralized in a CSF at Dover AFB. The CSF assets were added to the Dover lean level requirements to establish the total number of assets located at Dover. Originally the plan called for the CSF assets to be located at Dover but be controlled on the command supply account. Due to SBSS limitations, this was not possible. Control of where paperwork prints, such as shipping documents, could not be guaranteed. Dover was chosen as the storage location because 40% of all requirements for C-5 items already pass through Dover. Other storage locations considered included Scott AFB to facilitate use of the command supply account and Memphis, Tennessee, in a Defense Logistics Agency-operated storage and distribution facility. (1)

CSF stock levels were determined using the SBSS Repair Cycle Demand Level (RCDL) formula by calculating a daily Air Force demand rate for each National Stock Number (NSN), then constraining RCT and NCT to zero. O&ST was determined by adding the projected depot repair time (different for each NSN), time to move the repairable item from the base to the depot, time to move the repaired asset from the depot to the CSF, and the actual repair time in the O&ST formula unique to Lean Logistics leveling processes. Levels at Dover were initially established as fixed special levels. Due to the reject problem and because CSF levels plus Dover lean levels were greater than the original demand level, the fixed levels were replaced by minimum levels. This eliminated the reject problem.

Findings:

- System limitations of the SBSS required Dover and CSF levels to be combined. In some cases, this left Dover levels vulnerable to be used to fill other base requirements and, in other cases, made Dover asset rich.
- Use of any type of special level prevents use of actual current consumption data from being used to automate level calculation.
- As with the base levels, the formula used was accurate based on metrics.
- Level determination is labor intensive.
- Shipments from depot to Dover, then Dover to other bases could cause additional shipment costs. (1)
- Manpower to receive, store, and ship this limited number of assets was provided by Dover. As program grows, resources such as manpower, computer time, warehousing, and budget must be considered. (1)
- Requisitions were not being received by Dover (CSF). On those items receiving numerical follow-up status (99, 98, etc.), versus alpha status (BA, BB, etc.), it was necessary to telephone Dover to see if the requisitions had been received. In most cases, the numerical status requisitions had not been received.

Suggested changes:

- Eliminate CSF concept, adopt the consolidated serviceable inventory (CSI) at the source of repair concept being used by AFMC during their shop demonstrations. This should reduce second destination charges. (1)

Control of Serviceable Assets Distribution

Using the CSF as the point of distribution, all other bases send requisitions to the CSF via requisition override records rather than to the depots. The requisition override also assigns project code 879 and priority 02 to all requests. Requisitions were sent to the CSF as fill or pass to depot. When stock was available at the CSF, a release document was processed to ship the property to the requesting base. When the CSF was zero balance, the requisition was forwarded to the depot. The depot shipped directly to the requesting base as directed by the command stock control (CSC).

The CSC pulled R29 listings (Problem Item Listing) from each

lean logistics base on a weekly basis. These listings gave the CSC complete visibility of each NSN in the demonstration. Originally, these listings were reviewed page-by-page, base-by-base, to identify possible problem areas in holding Due In From Maintenance (DIFM) assets, excess, shortages, requisitioning problems, and RSP positions. A local program was developed to help identify problem NSNs, saving a considerable amount of man-hours in the CSC.

Release to base requisitions was to be automatic using the Uniform Materiel Movement and Issue Priority System (UMMIPS) as the release sequence unless there was a shortage of serviceable assets in the CSF. Problems verifying requisitions making it from the base to the CSF and from the CSF to the depot forced manual control of what should be an automated system. Fill or pass transactions did not create a transaction history at the CSF unless the property shipped; it was nearly impossible to verify when a requisition passed through the CSF to the depot. This was coupled with problems in requisition status reporting from the CSF to the requesting base and data losses experienced Air Force-wide. The CSC was required to take extensive actions to distribute assets from the CSF to the bases. A possible solution was fill or backorder methods. This method takes requisitions from supported bases and creates a backorder at the CSF when property is not available. The creation of a backorder allowed the CSC to verify requisitions are making it from the base to the CSF. This method had its own set of problems. The CSC and CSF are working to identify and determine effects of fill or backorder before process changes are made.

Findings:

- SBSS was not developed to operate as a full-scale distribution system.
  - — Full implementation using SBSS will require schema changes.
  - — Other computer systems and software may be necessary for this element of command and control.
- Requisition tracking between the requester and the receiver is at best hard.
- The fill or pass program did not work as explained in AFM 23-110, *The US Air Force Supply Manual* (formerly AFM 67-1, *USAF Standard Base Supply System*).
  - — Testing all parts of the process to determine specific problems will be identified to SSC.
  - — Considering an alternate method—fill or backorder.
- CSF experienced excessive computer downtime.
  - — No post-post procedures were developed for CSF operation.
  - — No visibility of available assets at the CSF (or depot) during down time.
  - — Complicated process to get part out of CSF when computer is down.
  - — Extremely difficult to get part out of depot when their computer is down.
- Stock control actions at bases were easier to look at when centralized at command level.
- Not currently using an automated decision tool to distribute limited serviceable assets. A best guess is based on information provided by bases and HQ AMC/LGSWA.
- Possible second destination transportation charges using CSF. (1)

Suggested changes:

- Use fill or backorder as opposed to fill or pass.
- Use Distribution of Repairables in Variable Environments (DRIVE) off-line to determine if correct distribution decisions are being made.

Reducing the Pipeline

RAND's intent was to make materiel management and distribution processes much more responsive to known needs while greatly reducing requirements for stock and management interventions. The C-5 demonstration sought to decrease transit times for assets in all segments of the pipeline:

(1) Retrograde shipment to source of repair (SOR).
(2) Serviceable shipment from depot to CSF.
(3) Serviceable shipment from CSF to customers.

Retrograde Shipment to Source of Repair (SOR)

AMC instructed all units to rapidly evacuate reparables to the reparable shipping destination; a maximum of 2 days to ship NRTS 1 items off base was established, and a maximum of 4 days total, including awaiting parts (AWP) time, was allowed when bases had repair capability. Using the Express Package Processing (EP2) program at AMC bases, all retrograde assets were shipped to the SOR using overnight transportation arrangements.

Additionally, constraint of the base repair time was thought to be having an adverse effect on base repair capabilities and repair parts levels.

Findings:

- Increased cost for retrograde shipping. (1)
- This part of the pipeline is working (overall retrograde time averaged less than 2 days).
- Possible adverse effect to base repair.

Suggested changes:

- Express retrograde shipments should continue.
- Base repair time constraints should be removed, but watched closely.

Serviceable Shipment from Depot to CSF

To expedite shipment of asset from the depot to the CSF, project code 879 with an associated required delivery date (RDD) of 777 (priority code for Lean Logistics) was established. According to the Defense Logistics Agency (DLA), most

shipments were delivered within 48 hours, which is within the established time frame for this demonstration.

Working with HQ USAF/LGS, a depot/SBSS program change was developed which should automatically code both retrograde movement and requisitions with the Lean Logistics handling priorities. This will allow DLA to use overnight delivery service. The coding has been completed.

Findings:

- Using DLA-provided data, this part of the pipeline is working.

Suggested changes:

- None.

Serviceable Shipment from CSF to Customers

Dover, as the CSF, uses EP2 to ship all assets to the customers.

Findings:

- Increased transportation cost at Dover. (1)
- EP2 program was working well.

Suggested changes:

- Discontinue the CSF concept.

Streamlining Base Repair Processes and Accelerating Depot Repair Processes

RAND's intent was to make management simplified, reduce no-value added actions and indirect labor, and implement "repair-on-demand" with small amounts of system-wide stocks.

As previously stated, the demonstration was not specifically designed to streamline the depot repair process, but only the handling processes.

The idea is to bypass base-level supply processing when items are removed from aircraft. After local repair is attempted, items would immediately move directly to the contractor or organic depot repair shops, bypassing traditional depot supply receiving and storage, traditional repair scheduling, intra-depot materiel movement, and enter repair immediately upon delivery to the shop.

After repair, the items would immediately move (via air express) through the hubs to the operational commands, either directly to their bases or to the CSF. The operational commands would maintain sufficient materiel at the CSF to respond immediately to demands from the bases.

The end goal would be to streamline the system so materiel would move faster than current system and greatly reduce many indirect processes (clerical, scheduling, expediting) and their associated costs.

To date, the C-5 demonstration has tested the following premises of rapid transportation:

(1) Accelerate base/depot handling processes.
(2) Reduce handling time.

Accelerate Base/Depot Handling Processes

The reparable pipeline is the lifeline of the system. Special attention for prompt reparable processing is the joint concern of maintenance, supply, and transportation. To meet expectations of the RAND model, base-level maintenance activities must expedite reparables from the flight line, through the back shops, and on to base supply. Base supply then will expedite turn-in and shipment processing. Confidence in the logistics system is, at best, mixed. Slow response times encourage customers to hoard supplies as a hedge against the unreliability of the system. When carcasses are short, this type of action can result in a lack of assets to repair at depot.

Depot-level maintenance activities and their supporting DLA storage/transportation activities established coordinated procedures to streamline/accelerate the flow of reparables from the depot repair line to the applicable repair shop. Processes were streamlined/accelerated to meet the depot maintenance reparable evacuation pipeline standard to 2 days for direct NRTS items and 4 days (including AWP days) for all other reparables.

Findings:

- The development of the central storage facility at Dover as a buffer to store sufficient materiel to respond immediately to demands from the bases was successful, but not the best method.
  - Dover encountered some initial problems with the fill/pass method.
- Bases did not evacuate NRTS 4 items within the 4-day window. DLR costs encourage the bases to hold on to assets. We reiterate the fact CSF did not ship a serviceable asset until the unserviceable lean level item was shipped.
- Holding on to end items in AWP status delayed replenishment and caused the base to exceed the 4-day pipeline standard for base RCT.

Suggested changes:

- Eliminate the CSF concept.
- Do not ship serviceable assets until the unserviceable lean level item is shipped.
  - Backorder all support bits and pieces as lean level items.

Reduce Handling Time

The demonstration measured this in several areas, most specifically with the repair cycle time at the base and the depot and the shop/depot repair time. The base RCT measurement included the elapsed time from removal of a reparable from the end item until the reparable was returned to serviceable condition. The depot RCT measured the time from the receipt of a reparable until the item was shipped back in serviceable condition to the CSF (includes DLA handling time and shop repair time).

Shop repair time measured time from the receipt of a reparable at the depot repair shop until the item was offered to DLA distribution function as a serviceable asset. This time was quoted from the source of repair. Depot repair cycle time represented the time elapsed from shipment of a reparable from a base until the item was available in serviceable condition at the CSF (transportation time from a base to depot, depot processing time, shop repair time, and transportaion from the depot to the CSF).

Findings:

- The base RCT time has gone from an average of 8 days prior to the demonstration start to an average of 3.5 days. This, however, might be a reflection of the decline in NRTS 4 turn-ins.

Suggested changes:

- Monitor the RCT system using Air Force Logistics Information File (AFLIF) or advance traceability and control (ATAC).

Although the original goal was to test the architecture of the logistics system, it included a MAJCOM "user in control" concept. Headquarters AMC accomplished this by:

(1) Setting levels (leaned levels at the six C-5 bases).

(2) Owning/managing (point of sale) all serviceable stock (CSF at Dover).

(3) Making distribution decisions to the wings (CSC at HQ AMC).

(4) Customer (user) demands drive repair. (One of the major tenants of Lean Logistics application with the C-5 is repair based upon actual demand. Addressed specifically because Ogden Air Logistics Center has not always had a negotiated repair level to support direct induction into repair.)

Summary

The C-5 Demonstration had many positive effects:

(1) Fast transportation supportability with both Federal Express and the EP2 system.

(2) User involvement in repair/distribution priorities.

(3) Ease of improving small group of NSNs supportability.

(4) Reducing pipelines may reduce inventory requirements.

(5) Depots reduced repair times on 17 of 24 items from an average of 30 days to 15 days.

On the other hand, Phase I turned out to be manpower intensive. It took a tremendous effort, through hand massaging and manual intervention, to make the test of just 24 NSNs and their interchangeables/substitutes work. Future Lean Logistics initiatives should be completely automated and each process thoroughly examined before implementation.

As stated in the Foreword of the *Department of Defense Logistics Strategic Plan,* Edition 1994, "DoD cannot afford to solve future logistics challenges as it often has in the past, through sheer mass. The pressure of fiscal limits, combined with the demands of regional conflicts, humanitarian support, and other non-traditional missions all put a premium on logistics *performance and flexibility.*" (3)

The logistics system of the future must provide reliable, flexible, cost-effective and prompt logistics support, information and services, plus achieve a lean infrastructure. The whole concept of Lean Logistics is one of continuous improvements. The C-5 demonstration has presented a wealth of information necessary to help make better decisions on implementing Lean Logistics into the total Air Force.

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Captain Surrey is presently Chief, Supply Readiness Section, Headquarters Air Mobility Command, Scott AFB, Illinois. Sergeant Honious was previously Superintendent, Supply Readiness Section, Headquarters Air Mobility Command, and is now retired.

Most Significant Article Award

The Editorial Advisory Board has selected "A Proposal to Restructure the Logistics Group" by Lieutenant Colonel Michael R. Van House, USAF, as the most significant article in the Summer 1995 issue of the *Air Force Journal of Logistics.*

Air Force Logistics Management Agency FY 96 Program

Below are our in-work projects for FY 96. If you are interested in any of these projects, please contact the project officer. If commercial lines are used, dial Area Code (334) 416-plus the last four digits of the DSN number.

Contracting

Military Family Housing Contracts Analysis, LC953550

Objective: Conduct an analysis of the Air Force Family Housing Investment Acquisition Process and recommend improvements to the program. This will include reviewing the requirements process at the time of Congressional appropriations as well as the acquisition planning and contract close-out methods. Although the problem statement identifies funds obligation ability (awarding a contract) as the focus of this study, the impact of the award process also affects the administration process. The final outcome will be recommended improvements and development of appropriate guidance to the processes and goals of Civil Engineering and Contracting activities in executing the Housing Program.

Capt Thomas Snyder, AFLMA/LGC, DSN 596-4085

Utility Contracting Reference Guide, LC962840

Objective: Develop a simple, easy-to-use utility reference guide that is useful to contracting and civil engineering organizations and can be used as a reference document for Contracting training organizations.

Capt John Perry, AFLMA/LGC, DSN 596-4085

Standard Contracting Squadron Training Plan, LC962913

Objective: Increase the knowledge and professionalism of the USAF contracting work force by developing an Air Force Contracting Squadron Training Plan. This plan would be applicable to all USAF contracting personnel and can be tailored to organizational needs.

MSgt Lisa Rogers, AFLMA/LGC, DSN 596-4085

Customer Education and Simplified Acquisition Handbook, LC952690

Objective: Develop a handbook to provide buyers and customers with a reference guide which explains the day-to-day processes for simplified acquisitions. The handbook will eliminate confusion in the field, improve the quality and timeliness of the acquisition process, and inform customers of the processes and requirements for processing purchase requisitions.

SMSgt Jose Medina, AFLMA/LGC, DSN 596-4085

Deployable Contract Action Tracking System (DCATS) Printing Enhancement, LC952501

Objective: Enhance the current version of DCATS to improve its printing capability. This will include increasing its compatibility with printers and its ability to print through a local area network.

Capt Thomas Snyder, AFLMA/LGC, DSN 596-4085

Maintenance and Munitions

Wholesale Forecasting of Time Change Items, LM942300

Objectives: (1) Evaluate current forecasting process and identify strengths and limitations in light of fiscal and manpower constraints. (2) Define raw data requirements for accurate forecasting, including variables such as procurement lead time, shelf life, service life, and weapon system modifications, among others. Determine who and at what level should be responsible for inputting and updating the data. (3) Determine if existing supply or maintenance data collection systems can be programmed to use this raw data to calculate and compile time change item forecasts and transmit them to the procurement point in a usable format. If not, determine if they can be expanded to perform forecasting functions and at what cost. (4) Determine if there are other automated systems available in other Department of Defense (DOD) agencies, in development, or in the corporate world, which have the capability to forecast requirements for time change items. (5) Analyze all available options and recommend the best method to efficiently and effectively forecast time change items in both the short and long term.

Capt Carey Tucker, AFLMA/LGM, DSN 596-4581

Integrated Maintenance Data System (IMDS) Functional Requirements Collection, LM950521

Objective: Coordinate collection of functional requirements, both high and low level, from the various major commands to facilitate development of IMDS through the contractual process. These functional requirements will be incorporated into several documents such as Operational Requirements Documents (ORDs), Functional Descriptions (FDs), Concept of Operations (CONOPS), etc.

Capt Bradley Allen, AFLMA/LGM, DSN 596-4581

Cost-Benefit Analysis of Contracting Precision Measurement Equipment Laboratory (PMEL) Operations, LM950451

Objectives: (1) Determine optimal military/civil service/contractor mix for PMEL. (2) Evaluate impact of completely contracting out Air Force PMEL work load.

Capt Glenn Barney, AFLMA/LGM, DSN 596-4581

Cost Assessment of Two-Level Maintenance (2LM) Implementation (F-15 Avionics), LM950531

Objective: Restricted to F-15 avionics only. Analyze costs associated with avionics repair (Three-Level Maintenance versus Two-Level Maintenance):

a. Base-level manpower reductions.
b. Depot-level manpower increases.
c. Increased avionics transportation costs.

Capt Mark Gray, AFLMA/LGM, DSN 596-4581

Reengineering Base-Level Logistics Processes, LM951530

Objectives: (1) Document ongoing initiatives to streamline base-level reparable process and identify lessons learned. (2) Identify options to reengineer the base-level reparable asset pipeline system, reducing processing time and eliminating duplication of effort between functions. (3) Identify organizational, policy, and procedural changes necessary to implement the reengineered processes.

Capt Ed Kramer, AFLMA/LGM, DSN 596-4581

Munitions Metrics, LM953222

Objectives: (1) Determine what requirements (measurement data) should be in AFPD 21-2, *Nonnuclear and Nuclear Munitions*, and whether the Combat Ammunition System (CAS) is capable of providing this data to HQ USAF/LGM. (2) Evaluate the HQ USAFE/LGMW munitions metrics program and determine if Air Force-wide implementation is advisable.

CMSgt Allan Richardson, Jr., AFLMA/LGM, DSN 596-4581

Quality Assurance Product Improvement Program, LM953321

Objective: Develop a program (Windows based) to meet the needs of the current Air Combat Command Quality Assurance Program.

Capt Dee Jay Jackson, AFLMA/LGM, DSN 596-4581

Supply

Applying Application Percentages to Readiness Spares Package (RSP) Computations, LS940840

Objectives: (1) Determine impact of using different methodologies. (2) Develop an Air Force standard method for factoring percent of application into RSP computations.

Capt James Johnson, AFLMA/LGS, DSN 596-4165

Regionalization of Adjusted Level Stocks, LS941250

Objectives: (1) Examine current inventory levels and demand patterns for items assigned adjusted levels at selected bases. (2) Describe population of assets assigned adjusted levels. (3) Investigate utility of regionalized stockage for selected items. (4) Recommend implementation methodology for regionalizations, if feasible.

Capt James Johnson, AFLMA/LGS, DSN 596-4165

Analysis of the Redistribution Order (RDO) Process, LS943491

Objective: Examine the Redistribution Order process at the wholesale and retail levels of supply and recommend improvements to the current process.

SMSgt Richard Alford, AFLMA/LGS, DSN 596-4165

System Support Division (SSD) and General Support Division (GSD) Credit Policy Analysis, LS950190

Objectives: (1) Determine financial impact on customer Operations and Maintenance (O&M) funds and the SSD stock fund if current SSD credit policy replicated GSD credit policy for field-reparable and expendable items. (2) Evaluate current GSD credit policy and determine how much of the assets become excess to the base. (3) Determine impact of changing the credit policy to only grant credit up to the approved retention policies in effect for expendable and field-reparable items.

SMSgt Richard Alford, AFLMA/LGS, DSN 596-4165

Lean Logistics Retrograde Shipment Policy, LS950801

Objectives: (1) Define current policies and procedures for retrograde priority shipment. (2) Examine feasibility of using asset position to determine retrograde shipment policy. If feasible, assess benefits of revising shipment policy in terms of spares requirements, shipment costs, and data system requirements.

Capt James Johnson, AFLMA/LGS, DSN 596-4165

DD Form 1348-6 Program, LS951180

Objectives: (1) Write a DD Form 1348-6, DOD Single Line Item Requisition System Document, personal computer program for supply customers and supply personnel. (2) Eliminate duplication of inputs by supply personnel by feeding customer DD Form 1348-6 to a supply database and from supply to the Base Contracting Automated System (BCAS).

TSgt Goran Bencun, AFLMA/LGS, DSN 596-4165

Readiness Spares Package (RSP) Non-Optimized (NOP) Item Regionalization, LS951290

Objectives: (1) Propose a methodology for identifying the range and depth of RSP NOP items to regionalize. (2) Identify most cost-efficient location for regionalized NOP. (3) Identify cost and mission impact of the proposed methodology. If regionalization is feasible, propose a concept of operation.

Capt James Johnson, AFLMA/LGS, DSN 596-4165

Analysis of Consolidated Serviceable Inventories (CSI) and Working Level Setting Methodologies, LS951640

Objectives: (1) Define (in mathematical terms) the CSI management techniques for setting and updating working and CSI levels and take action lines. (2) Test and refine CSI management technique using actual data. (3) Measure CSI management technique performance and compare it to other leveling techniques. (4) Measure performance of a system that uses Readiness Base Levels (RBL) for base levels and the CSI management technique for depot levels. (5) Assist Air Force Materiel Command in implementing and testing leveling methods during their Requirements Reengineering demonstration at the Oklahoma City Air Logistics Center.

Capt Steve Long, AFLMA/LGS, DSN 596-4165

Analysis of the Supply Requisitioning System and Its Impact on Lean Logistics Implementation; Part 1: The Materiel Obligation Validation (MOV) Process, LS952020.

Objectives: (1) Determine degree and severity of requisition disparities between bases and sources of supply, including Air Logistics Centers (ALCs) and Defense Logistics Agency (DLA) service centers. (2) Evaluate effectiveness and efficiency of the MOV process as currently practiced within the Air Force.

Capt Rick Nelson, AFLMA/LGS, DSN 596-4165

Analysis of Warranty Parts Management, LS9630500

Objectives: (1) Examine warranty identification processes for centrally managed items. (2) Examine the Quality Deficiency Report (QDR) process for centrally managed items. (3) Examine existing/proposed systems for warranty tracking capabilities. (4) Identify costs of depot-level warranties. (5) Identify alternative warranty identification procedures and warranty claims processing procedures that satisfy regulatory requirements and reduce processing times. (6) Recommend a solution.

Mr Jay Mead, AFLMA/LGS, DSN 596-4165

Base Service Store (BSS) Cost Analysis, LS9510200

Objectives: (1) Compare total costs of purchasing janitorial and administrative supplies from the BSS with two alternatives: Option 1 - Purchase BSS items from General Services Agency (GSA) Customer Service Centers. Option 2 - Purchase BSS items from local business supply stores. (2) Examine impact of these options on base contracting and finance operations.

Mr Jay Mead, AFLMA/LGS, DSN 596-4165

Analysis of F-16 Training Wing Issue Effectiveness, LS953460

Objectives: (1) Investigate inequitable distribution of assets. (2) Determine whether Distribution and Repair in a Variable Environment (DRIVE) program, which strives to maximize aircraft availability, is creating this seemingly inequitable distribution of assets or whether it is being created by outside management decisions.

Capt Steve Long, AFLMA/LGS, DSN 596-4165

Transportation

Transportation Funding Analysis, LT941180

Objectives: (1) Determine if budgetary estimation process for Second Destination Transportation (SDT) Centrally Managed Allotment (CMA) account is accurate. (2) Determine if Standard Base Supply System is applying correct Transportation Account Code (TAC) logic on Military Standard Requisitioning and Issue Procedures (MILSTRIP) shipments entering the Defense Transportation System, and if non-MILSTRIP shipments are being annotated with proper TACs. (3) Determine if financial systems are properly processing SDT bills for payment.

Capt Inez Sookma, AFLMA/LGT, DSN 596-4464

Advanced Traceability and Control for Air Force (ATAC-AF) Data Evaluation, LT943490

Objective: Evaluate completeness of raw data feeding into ATAC-AF by subsystem.

Maj Douglas Tazoi, AFLMA/LGT, DSN 596-4464

Deployment Management System (DeMS) Version 2.0, LT950322

Objectives: (1) Redesign and code the old prototype Automated Mobility Processing System (AMPS) to include user requested enhancements and local area network (LAN) capabilities using a more stable software development tool. (2) Make the new DeMS software available for stand-alone use and install LAN sites as directed by HQ USAF.

Capt Rick Coons, AFLMA/LGT, DSN 596-4464

Core/Non-Core Transportation Functions, LT952351

Objectives: Tentative: (1) Develop a list of all transportation functions. (2) Analyze these functions and identify those which should be coded as "go to war" activities. (3) Provide recommendations for privatization and civilianization of non-core functions.

Capt Mike McDaniel, AFLMA/LGT, DSN 596-4464

O&M Budgeting for Traffic Management Flights, LT952610

Objective: Develop a method to project budget estimates for Traffic Management Flights.

Capt Mike Conley, AFLMA/LGT, DSN 596-4464

Logistics Plans

Deployment of War Reserve Materiel (WRM) Assets, LX932891

Objectives: (1) Review current items identified for WRM and

determine their potential for deployment. (2) Examine what types of equipment and other materiel are appropriate in building deployable WRM into a unit type code (UTC) configuration. (3) Determine how to best display and disseminate data reflecting accountability, availability, location, and accessibility of WRM UTCs.

Maj Michael Hall, AFLMA/LGX, DSN 596-3535

Korean Collocated Operating Base (COB) Assessment Program, LX933531

Objective: Develop an automated assessment program for timely determination and transmission of COB mission readiness that satisfies all of the sponsor's initial requirements.

Capt Joe Fleming, AFLMA/LGX, DSN 596-3535

Improvements to the LOGFOR Process, LX940131

Objectives: (1) Define the current Logistics Forces (LOGFOR) process prescribed by regulation and compare with the actual process. (2) Identify areas for improvement in the current process. (3) Recommend how those improvements might be achieved.

Mr Harold Newhouse, Jr., AFLMA/LGX, DSN 596-3535

Unit Type Code (UTC) Beddown Support Planning Tool (UBSPT), LX941194

Objective: Develop a set of databases to automate the UTC beddown and base reception plan processes. The primary product will be a pair of databases and a comparison software program. Application of these tools will give the customer the ability to compare reception force requirements with base support capabilities, and generate a database of items in shortage or overage conditions. These items may then be identified by the commander as limiting factors (LIMFACs), shortfalls, War Reserve Materiel needs, or non-issue.

Capt Carmine Vilardi, AFLMA/LGX, DSN 596-3535

Support Agreement Management System (SAMS)(V4.0), LX941198

Objectives: (1) Upgrade present SAMS program to provide the ability to use Microsoft Access 2.0 and Microsoft Word 6.0 in a Microsoft Windows environment. Using a "minimal paper" system approach, provide data-sharing capability between the units and their major commands via e-mail, Internet, floppy disk, or modem. SAMS 4.0 will provide several user-friendly, Windows-style analysis tools and reports. (2) Provide a user's guide enabling a new user to quickly learn the software with limited outside instruction.

Capt Joe Fleming, AFLMA/LGX, DSN 596-3535

Developing and Assessing USAF Unit Move Requirements for the Transportation Coordinators Automated Information Management System (TCAIMS II), LX950880

Objectives: (1) Evaluate and assess TCAIMS II system adequacy for Air Force units. (2) Report findings to the Department of Defense Joint Transportation Corporate Information Management Center.

SMSgt Mike Smith, AFLMA/LGX, DSN 596-3535

Enhanced Contingency Logistics Planning and Support Environment: Defining a Vision for Future Deployment Planning

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Introduction

This paper describes the technology development and demonstration opportunities associated with the Enhanced Contingency Logistics Planning and Support Environment (ECLiPSE) research and development (R&D) initiative being sponsored by the Armstrong Laboratory, Logistics Research Division (AL/HRG) located at Wright-Patterson AFB, Ohio. The objective of ECLiPSE is to improve wing deployment planning and replanning, reduce mobility footprint, reduce deployment response time, and use deployment resources more effectively and efficiently.

In January 1995, AL/HRG published an in-depth report titled "The Enhanced Contingency Logistics Planning and Support Environment (ECLiPSE): The Vision" (AL/HR-TR-1995-0005). This report identifies current problems, briefly describes related on-going initiatives, defines the ECLiPSE Vision, and introduces the state-of-the-art technologies that will contribute towards the realization of the ECLiPSE Vision. This paper is being used to disseminate information to a wider audience. It is structured to:

(1) Discuss the genesis of the ECLiPSE Vision.
(2) Introduce the ECLiPSE Vision.
(3) Discuss related initiatives.
(4) Discuss the necessary steps required to realize the Vision.

Genesis of the ECLiPSE Vision

In March 1994, AL/HRG management tasked a study team to develop research plans to improve the Air Force's ability to deploy and operate in support of Air Force contingency operations. The study team was guided by the following instructions: focus on the Air Force's growing need to reduce mobility footprint, reduce deployment response time, and use deployment resources more effectively and efficiently. For each potential area, the team needed to answer three critical questions:

(1) What is the Air Force logistics problem?
(2) Can AL/HRG do something about it (is it a technology problem)?
(3) Is someone else already solving the problem?

The study team scoped their research to wing logistics planning. They narrowed their focus to wing-level planning because other Department of Defense (DOD) research organizations are already highly involved in demonstrating technology for theater command and Joint Task Force-level planning.

To formulate the unit-level ECLiPSE Vision, the team first focused on user problems by reading applicable documents and talking to users. Over the course of the study effort, the team visited Headquarters Air Combat Command/LGX/LGS, Headquarters United States Air Force/LGX/LGS, the Air Force Logistics Management Agency/LGX, and the LGX shops at Mountain Home AFB, Idaho; Spangdahlem AB, Germany; and Wright-Patterson AFB, Ohio.

In addition to focusing on current problems, the team also collected information on initiatives attempting to address these problems. First, the team conducted an extensive literature search that revealed numerous tools currently in use or under development such as Computer Aided Load Manifesting (CALM), Cargo Movement Operations System (CMOS), Manpower and Personnel-Base Level (MANPER-B), etc. The team also interviewed managers of systems that are addressing deployment needs. The systems that were investigated in this manner are:

- The Integrated Deployment System (IDS).
- The Wing Command and Control System (WCCS).
- The Logistics Module-Base Level (LOGMOD-B) Modernization system.
- The Combat Readiness and Infrastructure Support Information System (CRISIS).
- The automated post-post supply system.
- The Deployment Management System (DeMS).

To develop the ECLiPSE Vision, the team also surveyed "information technology" organizations to identify related efforts and applicable technologies. In addition to a thorough literature review, the team attended numerous working group meetings and met one-on-one with technologists from various DOD organizations. The team developed the ECLiPSE Vision based on a survey of on-going Air Force programs, on-going research efforts, and applicable technologies.

Logistics Planning Problems

Based on their survey of logistics planning, the team found numerous opportunities to improve deployment logistics and logistics planning. The team then discussed these deployment planning problems with representatives from numerous operational Air Force units, headquarters organizations, and the Air Force Logistics Management Agency (AFLMA). These discussions reinforced the existence of problems highlighted in the literature and allowed the team to witness current methods

for deployment planning. In general, these efforts highlighted logistics planning problems related to the reliability and level of integration of current planning systems, the accuracy and availability of needed information, and the amount of time necessary to accurately plan and replan for short-notice taskings. Many of these problems are being addressed by incremental upgrades to existing systems. For example, AFLMA's DeMS will go a long way towards integrating systems such as CALM, CMOS, LOGMOD-B, and MANPER-B. There is, however, still substantial opportunity to improve unit-level planning beyond the solutions embodied in these incremental improvements.

The Air Force uses the Contingency Operations/Mobility Planning and Execution System (COMPES) to perform deliberate logistics planning and replanning at the time of execution. In the current system, information dissemination and integration at the time of execution is a significant problem. Electronic communication of tailored Unit Type Codes (UTCs) between organizations within a unit and between units and headquarters is a problem because the current system is cumbersome and slow to use. During Desert Storm, the Automated Digital Network (AUTODIN) was a main communication link as opposed to the COMPES network. Also, base-level systems are not integrated. For example, although the current LOGMOD-B and CALM systems both use UTCs as a baseline, changing a UTC in LOGMOD-B does not change the same UTC in CALM. This leads to editing that could affect war-fighting capability.

In addition to the large amount of effort devoted to generate and maintain UTCs, the information needed to edit a UTC at execution time is often not current or is unavailable. This is a major problem because without current and accurate information, deployment planners cannot make good decisions on what materiel and personnel are needed for mission accomplishment. This lack of knowledge can lead to units deploying with either too much (wasting precious airlift capacity) or too little (hindering mission accomplishment). For example, many units tasked in Desert Storm/Shield did not have access to up-to-date Time Phased Force Deployment Listings (TPFDLs). Additionally, the Airfield Information File in the Global Command/Control System (GCCS) [formerly the World Wide Military Command and Control System (WWMCCS)] is often not useful because it is rarely current enough to support UTC tailoring.

Finally, even if information like expected flying schedule, airfield information, and TPFDLs were current and accurate, it would be very difficult to substantially tailor a UTC and adequately replan it in response to short-notice taskings. This difficulty is due to the huge amount of information contained in the relevant information sources and the small amount of time available to integrate the information effectively.

The ECLiPSE Vision

There are numerous on-going initiatives aimed at improving logistics planning. As previously stated, most of the laboratory initiatives are targeted at theater-level command and control. This level of planning focuses on selection, tasking, allocation, and employment of combat capability. In the Air Force, combat capability is provided through force packages called Unit Type Codes (UTCs). A UTC provides a particular combat capability as defined by the UTC's Mission Capability Statement (MISCAP). Very little research attention has been paid to how UTCs are generated, disseminated, maintained, and most importantly, tailored at execution time to provide the most capability for the least amount of assets. The ECLiPSE Vision was developed by focusing on UTCs. Implicit in the Vision is the assumption that if the Air Force can substantially improve the quality of information provided to deployment planners and can improve its capability to accurately tailor UTCs and quickly generate efficient load plans, then airlift will be saved and the right materiel will be deployed at the right place and time.

Fortunately, there are emerging technologies that have the potential to significantly enhance the contingency planning process. In the future, logistics planners will be able to take advantage of technologies like collaborative real time textual and audio/visual communication, artificial intelligence, multimedia information, and advanced decision support systems. Together, these and other technologies should provide logistics planners with significantly improved planning capabilities, far beyond the current and planned status quo. The ECLiPSE Vision takes the first step into the not-to-distant-future. The ECLiPSE Vision has three components:

(1) Deployment Information Support Environment.
(2) Unit Type Code Development, Tailoring, and Optimization.
(3) Logistics Analysis to Improve Deployability.
(4) Beddown Capability Assessment Tool.
(5) Total ECLiPSE.

Deployment Information Support Environment

The first component of ECLiPSE is the Deployment Information Support Environment (DISE). DISE consists of a Deployment Knowledge Base (DKB), multimedia site survey tools, and a graphical user interface/planning assistant (GUI/Planner).

Deployment Knowledge Base. The DKB will store and provide planners with site information including, but not limited to, air base maps, War Reserve Materiel (WRM) assets, multimedia site survey information, lessons learned, and in-place support agreements. The DKB component addresses the problem of airfield information accuracy and significantly improves the storage and presentation of the site information by utilizing audio visual display and storage technology. The problem of information accuracy is addressed by utilizing satellite and network communications to update the DKB. In peacetime, the DKB would be updated after every deployment and site survey. As beddown site characteristics change during an operation (bedding capacity and munitions storage capacity increases, etc.), the site's characteristics in the DKB will also be updated via a satellite communications link. By disseminating this information to every unit tasked to deploy to a specific site, logistics planners can be more confident in their UTC tailoring and other deployment planning activities.

In addition to storing site survey data, air base maps, WRM, lessons learned, support agreements, and other information, the DKB will need to be structured to support collaborative distributed beddown planning. Structuring the database to this type of planning is a research intensive task. It will also be

structured to store site-specific deployment lessons learned information obtained from previous deployments. How to collect and store lessons learned so that they can be immediately retrieved electronically at execution time is also a research intensive task.

Conceptually, the DKB could be hosted on the evolving Global Command/Control System (GCCS), the LOGMOD-B network, a stand-alone network, the Air Force Command and Control Network (AFC2N), or one of the other merging command and control systems. Regardless, it would be available to home station planners through network connections and to deployed planners through satellite links, network links, or via phone lines. It would have a short-term effect on the quality of beddown site information available to unit planners; however, the major benefit would accrue when the accurate and up-to-date site information is used in conjunction with other automated planning tools.

Multimedia Site Survey Tools. Obviously, the DKB must be filled with the proper information if it is to be useful. Multimedia site survey tools will be developed to populate the DKB. These tools will provide site survey teams with everything they need to gather vital deployment site information. The tools developed will include, at the minimum, an automated data collector, a digital camera, a palm-size video tape recorder, and a communication device to allow the information gathered to be sent back to the DKB in real time. The automated data collector will be hosted on a notebook computer-type device and will prompt the site survey teams for all pertinent information. All digital pictures and video will be fed into the automated data collector and linked to the appropriate textual data.

Graphical User Interface/Planning Assistant. All the information in the world does no good if there is no way to easily access and display that information. If DISE is going to be useful, it will need a friendly and intuitive user interface. The GUI/Planner uses a "drill down" approach. A planner will bring up the DISE system and be presented with a map of the world. The planner will select the region of interest, and the interface will present the region in a close up view. The planner can then select a specific country, location, and base. The interface will allow the planner to continue to drill down until the desired level of detail is reached. Ideally, the planner should be able to drill down to any piece of data required for thorough deployment and beddown planning. For instance, the planner should be able to use DISE to determine things such as how many gallons of JP-8 a given fuel cell will hold, what the present and average weather conditions are, how many pieces and what types of aerospace ground equipment (AGE) are available, etc. The planner should be able to access this information in a visual manner and not have to decipher from a list of cryptic codes. See Figure 1 for a representation of the DISE user interface.

To make this information even more useful, the GUI/Planner will allow two or more bases to bring up the same data at the same time and perform collaborative/distributive planning. If Moody, Shaw, and Mountain Home AFBs are all deploying to Base X at the same time, it would be beneficial for them to coordinate their planning activities.

The easiest way to envision the DISE concept is to think of it as a virtual air base. DISE will enable deployment planners to

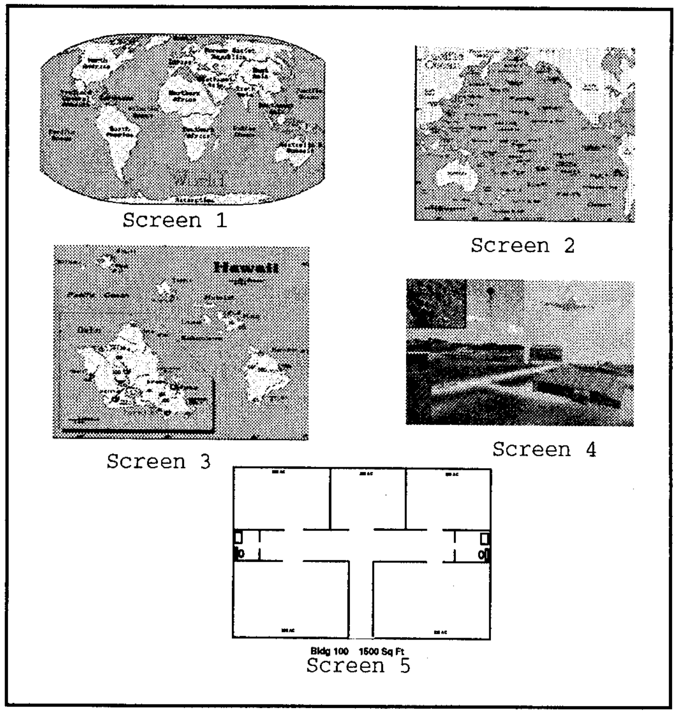

Figure 1. Conceptual Deployment Information Support Environment (DISE) User Interface

"visit" distant locations without ever leaving the comfort of their own home station(s).

Unit Type Code Development, Tailoring, and Optimization

UTCs are currently static lists that are manually created and stored in COMPES. Theoretically, they are independent of the location and unit. Defining and maintaining UTCs is a tedious and manpower-intensive process involving pilot units who develop the UTC and non-pilot units who live with the UTCs developed by pilot units. Additionally, at execution time, UTCs can be significantly tailored to meet the specific needs of the given deployment.

The development and tailoring portion of Unit Type Code Development, Tailoring, and Optimization (UTC-DTO) would take much of the tedium out of UTC development and provide for fast tailoring during crisis planning. In peacetime, UTCs could be automatically generated based upon Wartime Mobilization Plan (WMP) planning factors, table of allowances, and standard failure rates and repair time rates. In a short-notice tasking situation, the same software could automatically generate a "tailored" listing based on the beddown location, scenario inputs, and the standard failure/repair rates. Even better, failure rates and repair rates could be adjusted based on historical failure and repair information specific to the region of the deployment. For example, if engines failed at a higher (or lower) rate than the Air Force standard during the recent operations in Southwest Asia, then more (or less) engines would be included in the tailored UTC for the same situation in the future. Heaters provide a simplified example of this concept. Based on the beddown location and time of year, heaters could be automatically tailored from the "dynamic" UTC listing. By using simple and complex rules and calculations, this concept could be extended to every resource listed in the current UTC.

Information stored in the DKB would be needed to make this

capability a reality. If the concept can be successfully proven, the automatic UTC generation component could substantially reduce airlift required for short-notice contingency operations—primarily because, in very short-notice contingency operations, planners usually do not have time to significantly tailor UTCs.

The optimization portion of UTC-DTO would save time for deploying units as well as space for airlift assets. Based on the tailoring of a UTC discussed above and the weight and cube information provided by LOGMOD-B of each piece of equipment in a UTC, UTC-DTO would use algorithms to calculate the best way to load equipment onto standard 463L pallets. This in turn would reduce the total number of pallets required to deploy a UTC and ensure the pallet dimensions are compatible with the aircraft used to carry the pallets.

Logistics Analysis to Improve Deployability

Logistics Analysis to Improve Deployability (LOG-AID) is planned as a rigorous two-year requirements analysis of the wing deployment planning process. It will build on the ECLiPSE requirements study and the SAF/AQK Integrated Definition (IDEF) study. LOG-AID researchers will:

(1) Thoroughly observe deployment planning and execution at the wing-level during deployment exercises.
(2) Perform in-depth interviews of wing-level deployment planning and execution experts.
(3) Administer a survey instrument to wing-level deployment planning and execution personnel.

The objectives of this requirements analysis are to:

(1) Identify strengths and shortfalls in the current deployment planning and execution processes and supporting systems.
(2) Apply business process reengineering principles to improve the current deployment planning and execution processes.
(3) Define areas in which innovative technologies can provide order of magnitude improvements in effectiveness and efficiency.
(4) Define a best case wing deployment planning and execution system for implementation at a test base. (This program will be called Total ECLiPSE.)

Beddown Capability Assessment Tool

The Beddown Capability Assessment Tool (BCAT) is a joint Armstrong Laboratory and Air Force Logistics Management Agency effort to analyze and demonstrate the feasibility and usefulness of advanced computer software to perform force beddown planning. BCAT will provide capability for comparative analysis of weapon system support requirements and base-level support capabilities for effective beddown planning. The capability will also allow for identification of resource shortfalls or limiting factors (LIMFACs) which may drive support investment decisions at base level. The BCAT effort will explore the feasibility and utility of using computers to automate the reception planning process. The BCAT demonstration will be accomplished using the following steps:

(1) A user requirements analysis will be conducted to develop the framework and architecture for BCAT.
(2) Using commercial-off-the-shelf (COTS) software, a database structure will be developed that will facilitate user population of UTC beddown requirements in a standard format.
(3) Using COTS software, a database structure will be developed that will facilitate user population of beddown base capabilities in a standard format. This database will be defined such that every beddown base capability will be captured and represented as a one-to-one correlation with the UTC beddown requirements database.
(4) A database comparison routine will be developed with the capability to compare the UTC requirements database with the beddown base capabilities database and automatically generate a third database populated with all beddown considerations such as shortfalls, overages, potential LIMFACs, etc.

The BCAT effort dovetails perfectly with current Base Support Planning (BSP) initiatives. BCAT will enable BSP planners to electronically generate the BSP Part 1. The "delta" database, generated by comparing reception base capabilities with deploying unit requirements, will help planners develop the BSP Part 2.

Total ECLiPSE

The ECLiPSE Vision will culminate in Total ECLiPSE. Total ECLiPSE will use the results of LOG-AID as a blueprint to implement the technologies, processes, and concepts developed by prior AL/HRG research. This effort will install DISE, UTC-DTO, LOG-AID, BCAT, and other relevant technologies identified during the LOG-AID study at a selected Air Force base to demonstrate their potential to improve wing-level logistics deployment planning and execution, reduce deployment footprint, reduce deployment response time, and use deployment resources more effectively and efficiently Air Force wide.

Related Initiatives

The ECLiPSE Vision does not exist in a vacuum. There are numerous other related initiatives currently underway that can have a tremendous impact on the implementation of the ECLiPSE Vision. The ECLiPSE Vision in no way competes with these initiatives. Instead, ECLiPSE hopes to leverage these systems at every opportunity. For example, the AFLMA and the Standard Systems Group (SSG) in conjunction with HQ USAF/LGXX, are developing the Integrated Deployment System (IDS) discussed earlier in this paper. ECLiPSE plans to enhance the current IDS by plugging in through DeMS. Figure 2 illustrates the potential ECLiPSE/IDS interface.

Some additional programs are underway to enhance or work in conjunction with the COMPES system. Operational Taskings and Priorities (OT&P) is an initiative to provide a single source of information related to operational taskings and goals. OT&P will store four major types of data:

(1) Time Phased Force and Deployment Data (TPFDD).
(2) War and Mobilization Plan (WMP) data.
(3) USAF program data consisting of the Program Authority (PA) and the Program Document (PD).
(4) Air Force Materiel Command (AFMC) support team data.

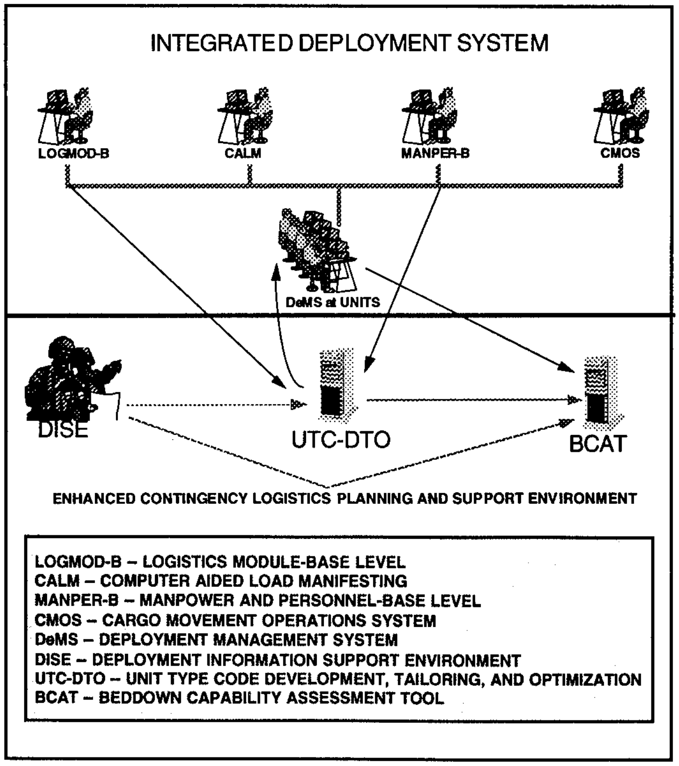

Figure 2. Enhanced Contingency Logistics Planning and Support Environment/Integrated Deployment System Interface

Originally an AFMC initiative, it appears an enhancement of OT&P will replace parts of COMPES.

Another initiative is the Air Force Operational Planning and Execution System (AFOPES). AFOPES will be the Air Force component of the Joint Operational Planning and Execution System (JOPES) which is a tool used by senior-level decision makers to monitor, plan, and execute mobilization, deployment, employment, and sustainment activities.

The Deployment and Crisis Action Planning and Execution System (DCAPES) is at present a high-level plan to build a next generation COMPES/JOPES system.

Finally, the Wing Command and Control System (WCCS) is a base/wing-level system integrating information from vital support functions (including mobility) for use by the wing commander and his/her staff to make critical command decisions and maintain effective management of battle resources. ECLiPSE has the potential to interface and share information with all of these systems.

In addition to the above, similar programs are being developed by our sister Services. The LOG-Anchor Desk (LAD) is a decision support system being developed by a consortium of the Advanced Research Projects Agency (ARPA), the Army Material Command (AMC), and the Defense Logistics Agency (DLA). LAD incorporates critical logistics information and a collection of advanced decision aids to support the generation and modification of logistical plans, to perform logistical analyses and assessments, and to solve logistical problems.

TransTech is a program sponsored by ARPA, the Maritime Systems Technology Office (MSTO), and the Software and Intelligent Systems Technology Office (SISTO). TransTech will potentially address the deployment, tracking, refurbishment, and redeployment of logistics and transportation assets used to conduct deployments in support of two nearly simultaneous major regional contingencies.

Once again, ECLiPSE in no way plans to compete with these other initiatives, but rather will work in conjunction with them to ensure interface requirements are identified, information requirements are met, similar technology is shared, and duplication of effort is avoided.

Steps Required to Realize the Vision

The first steps are currently in progress. Contracts have been let for DISE, UTC-DTO, and BCAT. These research efforts are currently under way. A contract for LOG-AID is expected to be signed in February of 1996. Users can expect to see results from DISE starting in July 1997, UTC-DTO in April of 1996, BCAT in June 1996, and LOG-AID in April 1998. In order for these programs and future efforts to be a success, we need constant user support and feedback. The ECLiPSE tools are designed for use by unit-level planners. It is imperative that we maintain a close working relationship with these field planners—these are the people who make the "rubber hit the road."

The end result of the ECLiPSE Vision research activities will be a model Air Force installation that can serve as an Air Force logistics planning technology insertion test-bed and benchmark.

Although this model base will be useful as a stand-alone product of the ECLiPSE research, it alone will not be enough to realize the ECLiPSE Vision. Air Force laboratories, Air Staff, Air Force major commands, and deployment planners will need to work together to ensure that research done by the laboratory community today, becomes the future deployment system of tomorrow.

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Rethinking Support Equipment

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Introduction

Nearly fifty years ago, Winston Churchill remarked ironically about the Royal Air Force that, except in the air, it is the least mobile of all the armed services. He noted that a squadron can reach its beddown destination in a few hours, but its support equipment, facilities, fuel, spare parts, and maintenance shops take many weeks more to develop. (1) The problem persists. Air power can be brought to bear quickly, but it cannot be sustained for very long without extensive logistics support.

The Problem: Logistics Footprint and Support Tail

The United States Air Force has several initiatives aimed at reducing logistics footprint and shortening the support tail. Lean Logistics and Two-Level Maintenance are innovative management strategies allowing base-level stocking requirements and intermediate maintenance facilities to be reduced by shortening cycle times of the depot repair pipeline. Another initiative is embodied in a new "ility"—deployability—by which total weapon system performance is now to be measured. Along with renewed emphasis on reliability and maintainability, the Air Force stresses ways to trim weight and volume from mobility packages to enhance deployability. Air Force Materiel Command (AFMC) advocates airlift pallet positions to be saved as one metric for evaluating the deployability impacts of research investments and technology insertions. (2)

In response to these initiatives, the design and packaging of flight line support equipment is starting to receive special attention.[1] This equipment is usually designed for one major function only. Flight line servicing and maintenance tasks require up to seven separate carts for aircraft electrical power generation, hydraulic and pneumatic pressure, cooled and heated air, nitrogen servicing, and so on. These machines each have self-contained engines and generators. In addition, since many aircraft types also have unique mission equipment and specialized maintenance and servicing requirements, each have their own array of unique and specialized support equipment also known as "peculiar" support equipment. Flight lines are crowded with many different types of common and peculiar, powered and nonpowered support equipment. Some types of common support equipment, such as -60 electrical generators, have uncommon characteristics because they are built by different manufacturers. This means more types of spare parts, technical data, and training are needed. Reducing proliferation is an important objective of the support equipment community.

Finally, consider mobility. To airlift a squadron from home base X to deployed base Y will require dozens of C-141 and/or C-5 missions. Even if deploying units are organized as wings with their own cargo aircraft, Air Mobility Command (AMC) will still have to allocate scarce airlift to move their cargo. A substantial portion of the airlifted weight will be flight line support equipment. Together with other types of rolling stock, support equipment of all types account for the majority of airlifted weight for deploying forces. Support equipment tends to be bulky and heavy, taking up an inordinate share of floor space. Thus, cargo aircraft tend to "cube out" before "weighing out."

A Possible Solution

Solutions to these problems will take various forms, and none of them will be free. But one solution seems to be especially valuable and feasible: making multifunction power carts (Figure 1). What if electrical power, hydraulic, and pneumatic requirements could be supplied by one integrated unit? Suppose this machine also had an air conditioner, a light-all, and a nitrogen generator. Further suppose a single engine and generator could provide power for all of these utilities in one wheeled cart. What if this new machine could be operated safely by one person and rolled onto a C-141 under its own power? Now let it be capable of meeting all the maintenance power requirements for all of the airplanes of a composite wing. Finally, assume that this machine weighed about as much as the current -60 generator and -10 air conditioner combined. When we repack the wing for deployment with such a piece of support equipment, we will need fewer C-141 sorties than we needed before. In sum, the logistics footprint for deployment is now in a smaller, less expensive shoe.[2]

Going even further, suppose a Rivet Work Force aircraft mechanic could learn to operate and maintain this multifunction cart. Since many functions are now incorporated into one cart rather than seven different carts, job enlargement through cross utilization would become more feasible. If so, then manpower requirements for support equipment maintenance in peacetime would decline, and fewer support people would have to deploy. (Logistics people leave footprints too!) With multifunction carts, there would be less congestion on the flight line, so there might be fewer mishaps. If there were a four-ship deployment to a remote operating location, one such cart might service all aircraft at the dispersed base. It would go on the single C-130 sortie that brings the rest of the unit's equipment. Finally, suppose a multifunction unit costs less than the many single-function units it would replace. Another new "ility"—affordability—would be served.

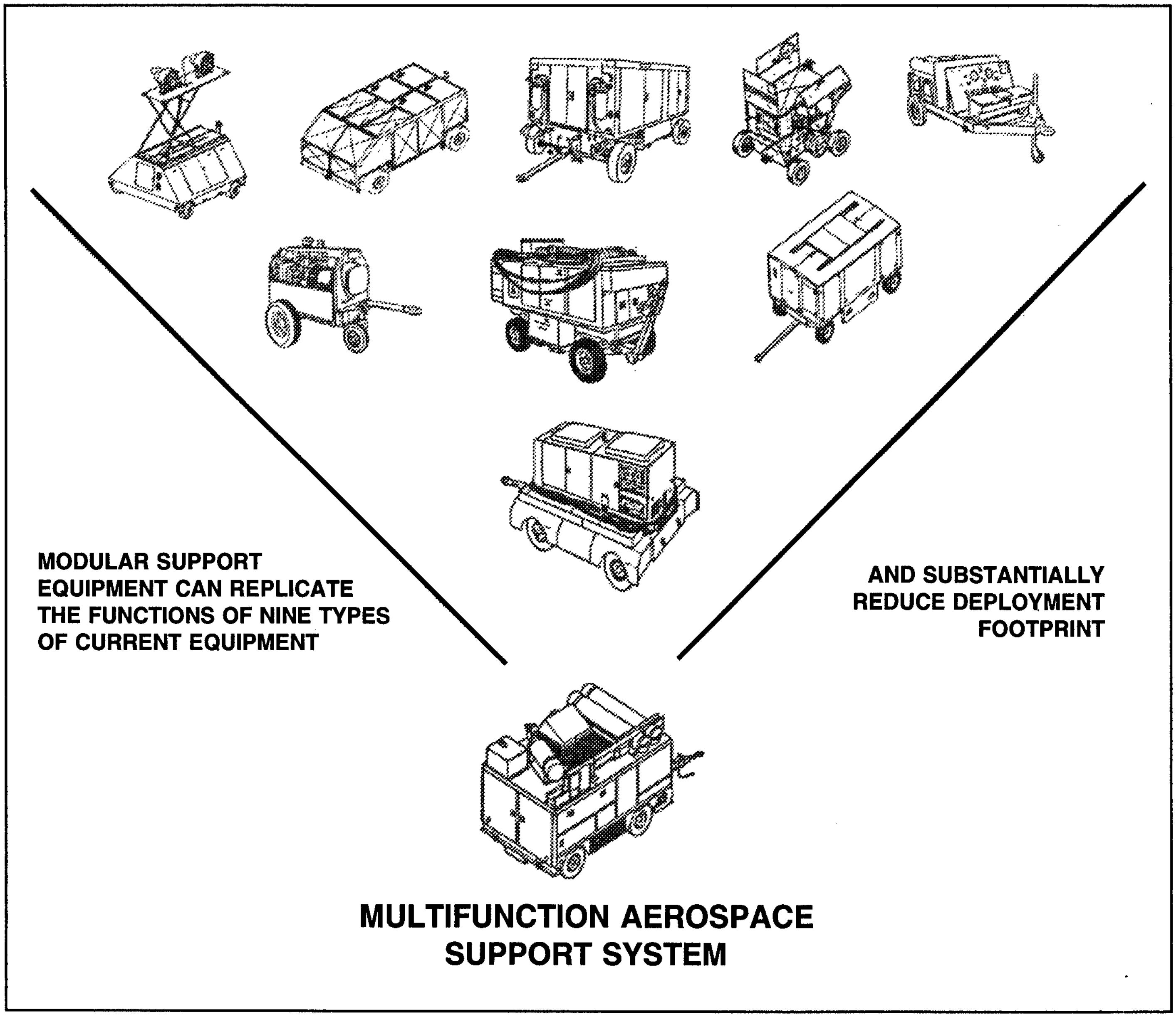

Figure 1. Multifunction Aerospace Support System (MASS)

Enter the Multifunction Aerospace Support System

Working with the Air Force support equipment and engineering communities, the Logistics Research Division of Armstrong Laboratory has begun an advanced development research effort aimed at demonstrating the feasibility of multifunction support equipment concepts for aircraft maintenance. Our major research objectives are to find better ways of packaging aircraft ground support power needs. In this context, better means smaller footprint for deployment and lower cost to operate and maintain the equipment in peacetime. The paragraphs below describe some of the research and technology issues forming our approach to developing a Multifunction Aerospace Support System (MASS).

Power Requirements

The overarching issue for MASS involves the specification of maintenance/servicing power requirements of different aircraft. While there is little doubt that a MASS machine can be created to satisfy all of the ground power needs of small aircraft like fighters, there is serious debate over whether the same machine could service larger aircraft like cargo airlifters. From many points of view, it is desirable to have a MASS configuration that can support the widest possible variety of aircraft. Yet a "big aircraft versus small aircraft" trade-off may have to be made. We may find that no single machine will be able to support all power requirements on all aircraft and still be small enough for air shipment or practical flight line use. On the other hand, it is not at all clear how often specific MASS utilities might be needed for specific maintenance and servicing tasks, nor how much power must be provided for these tasks. A performance specification for a MASS machine must take these specific aircraft requirements into explicit account.

The most serious void in defining MASS power requirements is the lack of basic engineering data on maintenance and servicing needs of specific aircraft. For example, the requirements for air

starting an aircraft engine are often stated with reference to the authorized support equipment. This makes the AGE unit the de facto standard for stating the requirement. For MASS purposes, the standard cannot be what works, but what is needed—demand, not supply. The problem is compounded by the fact that power levels needed for ground maintenance tasks are not necessarily the same as the power levels applied to aircraft subsystems in flight. Hydraulic pressure is an example of this. It takes far less hydraulic force to operate a wing flap for maintenance check on the ground than it does to move the flap when it is flying. Distinctions like this can make a difference in how MASS performance requirements are specified. Through the Contingency Operations Logistics Requirements (COLOR)[3] project, we are collecting specific aircraft power requirements for maintenance and service utilities for specific ground tasks. Aircraft grouped in composite wings are the initial targets for data collection supporting the MASS effort. These aircraft are F-16 (all models), F-15 (all models), and KC-135.

Support System Engineering

Superior supportability characteristics for new support equipment are vital because a few multifunction carts will substitute for a larger number of single-function carts. Although the configuration is not yet defined, it is clear that all power utilities (air compressor, hydraulic pump, and alternating current generator) will rely on the same power plant. Hence, to lose the engine is to lose all other functions. It is not clear whether the reliability of the MASS power plant (and other MASS subsystems) can be improved in the short run within an acceptable cost. Operational availability for the new unit must be demonstrably very high to be a fully viable equipment option for combat maintenance. Finally, maintainability of the MASS unit must receive special attention. At least in theory, shortfalls in reliability can be overcome by improved maintainability. It is often forgotten that reliability and maintainability stand in a trading relationship with respect to availability.

Reliability

The COLOR effort will also investigate reliability for support equipment reference systems. These are the existing machines whose functions are to be replicated by the new machine. There is a gaping data void on support equipment reliability. Until recently, this equipment has not been tracked through the Air Force's automated maintenance data collection systems. Hence, information on failure frequencies, modes, and effects for most types of support equipment must be adduced by "manual" means. That is, we will have to use paper records and interview technicians to derive reliability metrics. Without quantitative reliability data on reference systems, it will be impossible to benchmark reliability improvements for a new system. This appears to be a daunting task, but not all support equipment currently fielded is directly relevant. Attention will fall on seven baseline machines whose functions are to be replicated by MASS. These are:

(1) MC-lA Air Compressor.
(2) NF-2 Floodlight.
(3) Nitrogen Cart (Bottle and LN-2).
(4) A/M32C-lOD Air Conditioner.
(5) MJ2A Hydraulic Test Stand.
(6) MC-2A Low Pressure Compressor.
(7) A/M32A-60A and A/M32A-85D Generator Set.[4]

In the Logistics Support Analysis (LSA) world of acquisition, these carts would be called baseline comparison systems. That is to say, their mean-time-between-failure and mean-time-to-repair characteristics are used to describe a logistics supportability baseline for a new, multifunction machine. By altering system and subsystem reliability and maintainability targets for a MASS machine, we can derive supportability scores for different configuration options to support trade-off analysis. These are key parameters in determining how many MASS machines a squadron will need—that is, for determining the basis of issue—and overall life-cycle cost. They are also key inputs to LSA tools that evaluate level of repair policies and establish requirements for spare parts and maintenance manpower. The evaluation of these factors must take Lean Logistics, Two-Level Maintenance, Rivet Work Force, and other Air Force logistics objectives into account. In short, we need to design a support equipment strategy that limits sparing requirements through high reliability and parts standardization, that promotes a two-level maintenance policy through modular design and remove/replace maintenance, and enhances work force productivity through job enlargement and cross training.

Maintainability

It is also often forgotten that maintainability has a human face. Mean-time-to-repair (MTTR) is the average time a trained technician can do the job in given circumstances. By itself, this is very often a sterile number. It seldom takes account of variation in real-world maintenance personnel (size, ability level, etc.) and real-world maintenance circumstances (weather, parts scarcity, etc.). In developing estimates for maintainability, it is important to look at ways to reduce the variance in the repair times as well as reducing the mean. In this research, we want to capture real-world experiences of aerospace ground equipment (AGE) technicians to put a human face on maintainability. We will videotape specific AGE use and maintenance problems. The "voice of the customer" will also have a picture.

MASS Utilization

We have devised a maintenance simulation that compares notional multifunction machines with existing single-function machines.[5] Maintenance simulation allows benchmarks for reliability improvement to be derived and related to criterion measures such as sortie rate and system availability. A result of this style of simulation is an estimate of the number of machines needed to meet a given maintenance performance requirement. Other issues to be evaluated through maintenance simulation are:

(1) The payback from improving the reliability of MASS subsystems.

(2) The impact of configuring MASS with optional features such as self-propulsion and towing.

(3) The impact of mixing MASS units with single-function carts.

(4) The effects of MASS versus current AGE support on unit manpower requirements and utilization.

MASS Requirements Capture

As requirements (mechanical and logistics) for MASS are defined, we will enter them into a requirements tracking tool.[6] One of these tools is a version of Quality Function Deployment (QFD), a graphical device showing the relationship of customer "wants" to engineering "hows" in a format referred to as the House of Quality. (Note: QFD is mentioned as a preferred system engineering tool in AFMCR 500-23, *Reliability, Maintainability, and Deployability (RM&D)*.)

Voice of the AGE Customer

Another important aspect of the total quality approach is the voice of the customer in product design conversation. Blue Two, the Lessons Learned Data Base, and the Logistics Needs system are three ways in which the Air Force has tried to capture user experiences with existing systems for use in new systems. We will carry this idea forward, but in an innovative way. Positive and negative features of baseline systems can be captured with video recordings of maintenance people using the equipment. The emphasis should be on both usability (or operability) of support equipment for servicing aircraft, and servicing and repair of the equipment itself. Together, these issues are more commonly known as "human factors engineering." By capturing human-centered support equipment features in this way, we hope to provide a visual audit trail linking current problems to future improvements in maintainability to be captured in MASS design.

Virtual Prototyping of Logistics Concepts

The visualization of logistics issues will be carried forward in another way. A new technology called "virtual reality" is opening up opportunities for inexpensive design evaluation and training. In separate work, funded in part by an award from the Defense Modeling and Simulation Office, we will use the MASS concept in a 3-dimensional (3-D) computer graphics simulation of combat maintenance. To demonstrate the feasibility of a virtual prototyping role for base-level combat logistics functions, we will use animated human models and distributed interactive simulation to realistically simulate ground maintenance of combat aircraft with current and new support equipment. We will create 3-D models of candidate MASS units and place them on a simulated air base. Technology for human modeling to illustrate maintainability issues is being developed under the Division's DEPTH[7] program.

Environmental Impacts

Although the MASS concept is focused on combat support of deployed fighting units, new support equipment will also serve in peacetime at locations within the United States. The Air Force faces increasingly stringent environmental standards on air pollution and noise. Consequently, MASS design trade studies must look for ways to mitigate environmental impact of hydrocarbon emissions and to reduce occupational hazards of noise in peacetime use. Technologies and/or configuration options leading to a "Green MASS" concept must be balanced by considerations of cost and schedule in an overall trade-off scheme.

Affordability

AFMC is stressing science and technology investment in the service of weapon system affordability. Historically, the stress has been on technologies that extend performance. The new orientation on weapon system affordability will bring a more balanced approach to design. The traditional trade-offs between acquisition and life-cycle cost and between cost and performance in design decision making are being expanded to include affordability. For MASS, this means choosing strategies and technologies that, when implemented, will produce the most cost-effective solution.

Aircraft Retrofit Alternative

Finally, there is another way to think about support equipment that goes well beyond repackaging these machines. Retrofitting aircraft with highly reliable, dual-mode auxiliary power units would eliminate the need for ground power carts, hydraulic mules, and air conditioners. This is the "More Electric Aircraft" vision of Wright Laboratory. An internal engine electrical starter and generator would replace engine gearboxes and provide sufficient power to run all aircraft electrical, hydraulic, and cooling needs for ground maintenance and system checkout. The deployment footprint for ground power equipment could be made much smaller if aircraft were equipped with these solid rotor electric machines. This concept could be applied to existing as well as planned systems.

Summary

Supportability investments for Air Force systems should extend across the logistics spectrum. Until recently, little attention has been given to support equipment. Even though support equipment has always been identified as an element of Integrated Logistics Support (ILS), it has not had the emphasis that other ILS elements have had. But as the implications of emerging mobility requirements become more widely understood, support equipment design innovations are bound to become more visible and valuable. In this article, we have suggested some possible directions for new design thinking. Modularity, multi-functionality, standardization, and outright elimination of support equipment are among the options that should be explored through focused research and engineering efforts. These efforts should look to current systems as well as future systems in devising and targeting technology solutions. Finally, in addition to promoting mobility, support equipment design options must also promote affordability. The challenge is not just to innovate in design technology, rather it is to locate the best mix of potential solutions balanced by affordability. In sum, the Air Force needs long legs and a short tail, but it does not have deep pockets.

References

1. Churchill, Winston. S., *Their Finest Hour,* Boston: Houghton Mifflin, 1949.
2. AFMCR 500-23, *Reliability, Maintainability, and Deployability (RM&D),* October 1993.

Notes

1. Support equipment is already an element of Integrated Logistics Support.
2. The number of sorties saved and costs foregone depend on how multifunction machines are actually configured and on cost accounting rules

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Career and Personnel Information

Civilian Career Management

Logistics Civilian Career Enhancement Program (LCCEP)

The Logistics Civilian Career Enhancement Program (LCCEP) Career Development Panel is responsible for reviewing training requirements, developing training criteria, and administering LCCEP training and development programs for over 13,000 LCCEP registrants. The panel also oversees the Logistics PALACE ACQUIRE Intern Program which brings outstanding college graduates into the logistics work force. In an effort to better focus LCCEP's resources in these areas, the LCCEP Career Development Panel held a strategic planning session to build a strategic plan identifying a vision, a mission statement, goals, and objectives.

VISION: Air Force people committed to developing civilian logistics leaders to meet the challenges of today and tomorrow.

MISSION: Develop policy for and administer education, training, and career broadening for LCCEP registrants and PALACE ACQUIRE interns.

The panel members agreed the four goals they developed were considered equal in importance. The goals and the prioritized objectives to support each goal are as follows:

GOAL: Implement an education and training program that produces the best qualified individuals to meet organizational needs.

OBJECTIVES:

a. Validate the effectiveness of career development programs through customer feedback.
b. Improve the quality and increase the number of candidates for the top career development programs.
c. Target programs to meet needs of people with top, middle, and lower whole person scores.
d. Screen and select courses based on competency and organizational needs.

GOAL: Develop a partnership with supervisors and registrants to enhance career development and growth.

OBJECTIVES:

a. Educate and train supervisors and registrants to understand career development and growth.
b. Develop a customer feedback mechanism.
c. Emphasize to senior logisticians the importance of their involvement in the nomination and placement of the career development candidates.

GOAL: Define requirements, champion resources, and build career development programs that maximize the return on investment.

OBJECTIVES:

a. Ensure full participation in the resource allocation process.
b. Determine return on investment of the career development program.

GOAL: Promote the achievement of LCCEP affirmative employment program goals through career development programs.

OBJECTIVES:

a. Identify specific career development needs and barriers impacting career development programs.
b. Encourage underrepresented groups to participate in career development.
c. Review the performance of the career development program as compared to the LCCEP population.

The present and future political and economic environments are ever changing and dictate a dynamic plan of action to meet Air Force operational needs. The implementation of each objective and goal will assist LCCEP in being more responsive to the needs of the Air Force as well as our customers (registrants, supervisors, and senior managers).

(Dexter J. Cochnauer, HQ AFPC/DPKCLR, DSN 487-5351)

Logistics Professional Development

Logistics Cross Flow Program Updates—What's New?

As most logisticians probably know, the US Air Force LG's cross flow program is off and running. Wing and major command (MAJCOM) LGs are deciding who they want to cross flow and then allowing these officers to get their feet wet in new logistics specialties. Units are identifying, through personnel channels, job openings for which cross flow candidates will be considered. Many officers are then applying for these jobs and some are getting them. Basic program criteria/guidelines have been published, and the field's learning curve is beginning to level off. Refinements, part of any evolving process, continue to be made. Now, here's what's new:

Bridge courses are now on line and Air Force Personnel Center (AFPC) assignment officers are scheduling approved cross flows for them. MAJCOMs do not currently schedule officers for bridge courses. The Aircraft Maintenance, Supply, and Logistics Plans courses are each four weeks in length. Transportation and

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Environmental News

DOD Shelf-Life Item Management

Is your organization incurring high disposal costs associated with shelf-life management? Are your shelf-life materials going to waste in storage? Is your organization aware of the new Department of Defense (DOD) resource that helps to manage shelf-life materiel? The Defense Logistics Agency (DLA) Operations Support Office (DOSO) will show you how to properly manage these items and train your personnel to reduce disposal costs by using the Materiel Quality Control Storage Standards and the Quality Status List (M-204) program.

Have you heard of the M-204 program? If not, you're not in step with the rest of DOD. DOSO is providing DOD shelf-life management training to include hands-on computer instruction via on line access to the DLA M-204 system. The training also provides DOD policy information on how to properly manage your shelf-life materials.

DOSO will be conducting training sessions at the Defense Supply Center, Richmond (DSCR) during FY96. Your activity can enroll students in any of the sessions or DOSO can come to your facility to conduct training. This training is guaranteed to provide your site with the most current DOD policy information and the latest technology resources used to manage shelf-life materiel! The DSCR sessions are tentatively scheduled for the following dates: 5-6 Mar 96, 4-5 Jun 96, and 4-5 Sep 96. Call DOSO now to request training for your activity. Contact Gilbert Ruffin at DSN 695-5224 or commercial (804) 279-5224 or Karen Wolfe at DSN 695-5212 or commercial (804) 279-5212.

Gilbert Ruffin
Supply Systems Analyst
DLA Operations Support Office
Richmond, Virginia

(Continued from page 32)

Missile Maintenance courses are two weeks. Officers who cross flow into supply are required to complete a 60-day base supply orientation and pass a written test on the read-ahead portion of the course prior to attending the in-residence portion—this will not be an easy test. A read-ahead portion of the Aircraft Maintenance bridge course is now being developed.

New options for gaining cross flow credit include: completing a Logistics Career Broadening tour at one of Air Force Materiel Command's Air Logistics Centers, or moving into a wholesale logistics or an acquisition position for two years. Since obtaining a second Air Force Specialty Code (AFSC) is not normally gained from these tours, officers will have to request waivers to obtain cross flow experience credit when they move into 21LXX (Logistician) positions at the lieutenant colonel grade.

Many more LGs are now identifying their overall cross flow "game plan" prior to making Permanent Change of Assignment (PCA) moves. This makes it much easier for assignment officers to process what may have previously appeared to be cross flow mismatches. Coordinating a unit's whole PCA picture has streamlined and improved the cross flow review and approval process. While AFPC still strives to meet time-on-station criteria, two-year continuous cross flow experience goals, and one-on-one swap objectives, exceptions have been worked on a case-by-case basis.

The logistics cross flow program is now off the ground. Although is has hit a couple of small air pockets on takeoff, it appears to be flying relatively smoothly. We expect sporadic periods of turbulence as the program continues to develop, but with good coordination and refined program criteria, we expect to reach a comfortable cruising altitude.

(Capt Debbie Elliot, HQ AFPC/DPASL, DSN 487-6417)

(Continued from page 31)

of deployment. Since there are so many unknowns, it seems unwise at this point to claim specific deployment and cost savings. Generally, though, if a unit equipped with such multifunction equipment saves only one sortie for mobility, the cost avoidance can exceed $100,000—not a trivial amount.

3. Contingency Operations Logistics Requirements (COLOR) is a compilation of support equipment design features and performance characteristics.
4. These machines might also be replaced by multifunction support equipment, but not on a one-for-one basis. A mix of old and new machines is probably the most practical solution over the short term, with the MASS machine aimed at deployment. Over the long term, the outright elimination of support equipment should be sought through on-board auxiliary power units and other means.
5. This work uses the Integrated Model Development Environment (IMDE), a simulation software tool under development by the Logistics Research Division of Armstrong Laboratory. This tool replicates many features of the well known Logistics Composite Model (LCOM), which is used to determine optimal levels of logistics resources (people, parts, etc.) at base level through Monte Carlo simulation.
6. Requirements Analysis Process in Design of Weapon Systems (RAPID-WS), an integrated software package supporting the requirements management process used by the Air Force. RAPID-WS is currently under development by the Logistics Research Division of Armstrong Laboratory.
7. Design Evaluation for Personnel, Training, and Human Factors (DEPTH) is a software tool using 3-D computer-aided design technology to simulate maintenance work visually. DEPTH generates realistic human form models that can be made to interact with computer aided design (CAD) representations of equipment to identify maintainability problems while systems are still in the early design stages.

Mr Boyle is a research psychologist and Mr Tracy is a mechanical engineer at Armstrong Laboratory, Logistics Research Division, Wright-Patterson AFB, Ohio. Colonel Smoot is presently Chief, Acquisition Logistics Branch, also at Armstrong Laboratory.

A New Look for Logistics Education: Introduction to Logistics (LOG 199) Goes on the Air

Dennis P. Dragich

Looking to learn more about logistics but hate going TDY? Does your supervisor or commander really want you to get the education you'll need to prepare for the future, but isn't too excited about the prospect of your leaving for two weeks? Don't want to be in Dayton for the kids' or spouse's birthday? Well, if you are stationed within the continental United States (CONUS), the Air Force Institute of Technology (AFIT) has got a deal for you! Beginning in May 1996, Air Force logisticians will be able to attend the Introduction to Logistics (LOG 199) course without leaving home. AFIT's School of Systems and Logistics will begin presenting the Introduction to Logistics course on satellite via the Air Technology Network (ATN) to Air Force bases throughout the CONUS this year.

Introduction to Logistics is the first step in a four-course sequence designed to provide logisticians a broader view of logistics and better prepare them for the responsibilities and opportunities that come with experience and promotion. The course prepares Air Force personnel for entry into logistics career fields by addressing the concept of Air Force logistics and its environment to include organizations, planning, integration of logistics systems, functions, principles, processes, and issues. Since students typically have a wide variety of experience and backgrounds, the course begins with basic logistics concepts and builds to a point where students understand the relationships among Air Force and other Department of Defense (DOD) logistics processes. The course provides a core of knowledge to which subsequent formal education and training programs can be keyed for officer, airmen, and civilian progression.

Since its inception in 1987, demand for LOG 199 has exceeded capacity at AFIT by nearly five to one. This resulted in many logistics personnel missing the opportunity to attend the course. Over the past year, Department of Logistics Management faculty have revised the course content with satellite broadcast in mind. While this will mean much larger class sizes, the course will still be based on small group activities and interactions among the students—something unique in satellite courses. Technology will play a big role in the new delivery method for the course. However, the main focus will continue to be on students learning from one another through the use of case studies and other small group activities. Voice mail, electronic mail, teleconferencing, and anticipated World Wide Web access will provide a variety of ways for students in geographically distant locations to interact, share experiences, pose questions, and get feedback.

Many AFIT graduates of the resident course have come to understand and appreciate the interactions of logistics processes through the Logistics Planning Exercise, LOG-PLAN-X. In it's original format, LOG-PLAN-X requires one facilitator per five students to enable close interaction and small group decision making. Distance education would require training and coordination of an extraordinary number of people to facilitate the exercise at locations which would vary with every class offering. To counter this, AFIT, the US Army Logistics Laboratory, and Thinking Tools, Inc. are developing a computer-based exercise utilizing the LOG-PLAN-X scenario and cast of

A Note for Commanders and Supervisors

Given the reductions in personnel and the high operational tempo being maintained throughout the Air Force, it can be difficult for you to release people for a two-week TDY to attend school. However, once people have departed, their participation in the course is assured. Distance education offers you decided advantages—it allows your students to participate in the course while still being available on the job. This has great value in that students can see topics in operation on the job that are discussed in class. It allows greater real world feedback within the class and quicker transmission of theories taught in class to the job.

However, the availability of the student also increases the temptation for students to miss classes for staff meetings, projects, training, and so forth. We ask for your help in avoiding this temptation during the time students are attending LOG 199. Even though a student may feel they do not need to attend a particular session due to personal expertise in a given area, ***that expertise is needed by the other students!*** Much of the learning in this course is the result of interactions among the students—not just lectures over the air. Keeping a mix of specialties and backgrounds in class is critical to making this course effective.

We realize that genuine emergencies will occur, and we will work with you on a case-by-case basis to keep your student up to speed and in the course. Please remember that in signing the DD Form 1556 (Request, Authorization, Agreement, Certification of Training and Reimbursement), you and your student are stating that they will be available for class and will have adequate opportunity on and off duty to accomplish course preparation tasks such as homework and reading that accompany the in-class lessons. We want this to be a valuable learning experience for your students and return them to you with new ideas and tools that will make them informed and better prepared logisticians for the Air Force.

characters. The new interactive exercise should be a part of the course by the end of FY 96. The exercise is expected to have a feel similar to Sim-City—a popular computer-based game which allows players to interact with their environment.

With the change in course format come some changes in the enrollment process. The limited number of quotas available in the past meant that major commands allocated the limited number of slots within their command. Using distance education means most of that process has gone away. Pacific Air Forces (PACAF), United States Air Forces in Europe (USAFE), and other sites not capable of receiving the broadcast will continue to attend a two-week course at Wright-Patterson AFB. These organizations will request course slots just as they have in the past. All other organizations—those capable of receiving the satellite broadcasts—will follow new procedures to register their students. Registration procedures for the satellite version are outlined in Table 1.

Who Should Attend?

The LOG 199 is specifically designed for the following personnel:

- Those who are new to logistics.
- Those assigned to or pending assignment to a position in:
  - Contracting.
  - Logistics Plans.
  - Maintenance.
  - Supply.
  - Transportation.

The class is open to the following grades:

Officers:	O-1 through O-3
NCOs:	E-5 through E-7
Civilians:	GS-05 through GS-12

Grade and specialty waivers may be granted by the course director.

Class Schedule

The new version of the course will be held twice during FY 96, beginning on 6 May 96 and 5 Aug 96. Class sessions will run from 1000 to 1230 Eastern Time on Mondays, Wednesdays, and Fridays.

Questions?

For academic questions contact the course director, Dennis Dragich:

Voice:	DSN 785-7777, extension 3212; Commercial 513-255-7777, extension 3212
Fax:	DSN 986-7881; Commercial 513-476-7881
E-mail:	ddragich@afit.af.mil
WWW:	Look for the AFIT LSM Home Page coming soon!!!

For administrative support questions (facilities, reservations, etc.) contact the LOG 199 Distance Education Course Manager:

Voice:	DSN 785-1167; Commercial 513-255-1167
Fax:	DSN 986-7622; Commercial 513-476-7622
Mail:	LOG 199 Course Manager AFIT/LSE Bldg 125 2950 P St, Rm 2010 Wright-Patterson AFB OH 45433-7765

Mr Dragich is an instructor in Logistics Management and course director for the Introduction to Logistics (LOG 199) course, Department of Logistics Management, School of Systems and Logistics, Air Force Institute of Technology, Wright-Patterson AFB, Ohio.

LOG 199, Introduction to Logistics
Application Procedures for Satellite Offerings

- Check with your supervisor to ensure you can be released for the course. Make sure your supervisor knows the times and dates the course is broadcast. Absences are not permitted.
- Contact your local Education Center (or the facility that schedules satellite courses) and see if they are available to receive the broadcast. Ask them to reserve the facility for the course using an AFIT Course Request and Satellite Site Information Sheet.
- Register for the course by providing a completed DD Form 1556 (Request, Authorization, Agreement, Certification of Training and Reimbursement) to the Education Center. Waivers must be approved by the AFIT course director before submitting the 1556. Waivers can be submitted by fax, e-mail, or letter to the address listed in the article.
- A minimum of five qualified students per site is required to receive the course.
- 30 days prior to the course, the Education Center closes applications and forwards them to AFIT for approval.
- Applications are approved and sites notified three weeks prior to the course.
- About one week prior to the course, you can pick up materials at the Education Center.
- On the first day of class, show up on time, with any materials you have received, ready to participate, learn, and enjoy the course.

Table 1. Application Procedures for LOG 199, Introduction to Logistics Satellite Offering

Maintenance and Supply at the Signal Corps Aviation School at North Island, 1912-1916

Roger G. Miller, PhD

The operational element of the US Army's earliest aeronautical organization, embodied in the Signal Corps Aviation School at College Park, Maryland, moved to North Island near San Diego, California, in 1912. The establishment of this center required the Aeronautical Division of the Signal Corps—the office responsible for Army aviation until 1917—to develop an infrastructure and system for supporting the military flying program. Modern base-level logistics had its origin in the Signal Corps Aviation School, a fact that makes that institution of some interest. Further, the Aviation School performed three functions. First, Aviation School resources in personnel, equipment, parts, and tools were devoted to the maintenance and repair of the Army aircraft assigned to the school. Second, at the same time, these same resources provided the instructors and instructional aids for future Army pilots and mechanics. Third, when the Army ordered its "air force" into the field, the deployed force comprised school airplanes, engines, and equipment, and had to be supported using the same resources. These separate, often conflicting, functions significantly compromised the effectiveness of the US Army aviation program.

In 1911, Congress provided the US Army with its first aviation appropriation—$125,000 for fiscal year 1912—enabling the service to purchase five airplanes and establish an aviation station and flying school at College Park, Maryland. On April 3, 1911, Captain Charles DeForrest Chandler assumed command, while civilian Henry S. Molineau became the Supervisor of Technical Repair. The school staff expanded as officers completed their training at the Curtiss and Wright Company schools and enlisted personnel arrived from the Signal Corps. The latter were untrained and inexperienced, however. Two of the new officers, Lieutenants Thomas DeWitt Milling and Henry H. "Hap" Arnold, developed a rudimentary maintenance training program for mechanics based on the knowledge they had gained at the Wright school. As part of this instruction, Milling and Arnold photographed a Wright and a Curtiss aircraft and labeled each part, developing in the process the Army's first system of nomenclature for airplane parts. The level of maintenance capability at the school also improved in late June 1911 with the arrival of the experienced mechanics from Lieutenant Benjamin D. "Bennie" Foulois's detachment, which had been at Fort Sam Houston, Texas, with *Signal Corps No. 1*, the US Army's first airplane.[1]

The winter weather at College Park, however, severely restricted flying. From November 1911 through April 1912, the school's personnel, aircraft, and equipment transferred bag and baggage to Augusta, Georgia, in search of better flying conditions. Obviously, moving the school back and forth each year with the attendant interruptions to training, supply, and maintenance was wasteful and inefficient. Conveniently, the lease on College Park was due to end, and in mid-1912 the Chief Signal Officer determined to move the school to San Diego where aviation pioneer Glenn Curtiss operated a flying school.[2]

The Signal Corps leased land on North Island, rented space in the Curtiss hangars, and borrowed the Curtiss facilities, machinery, and tools. The first detachment of enlisted personnel reached San Diego on November 4, 1912, and aircraft began arriving by the end of the year. In the meantime, the Aviation School's Wright aircraft were sent to Texas City, Texas, where they operated as the 1st Aero Squadron, as described below. The squadron moved to San Diego in June where it became the Wright section of the Signal Corps Aviation School. The school thus had a Wright section and a Curtiss section, a division dictated by the different control systems of the two aircraft types, as well as separate supply and maintenance requirements. Captain Arnold S. Cowan became commander of the Signal Corps Aviation School on June 29, 1913, and a civilian engine mechanic, Jake Bailey, arrived on August 20. By March 1914, wooden hangars sufficient for twelve aircraft and a machine shop had been completed. This facility served as the training center for US Army pilots and enlisted personnel until World War I.[3]

In mid-1914, following a series of fatal aircraft crashes, officials from the Office of the Inspector General recommended that the school hire a qualified aeronautical engineer and expert in construction techniques. They also emphasized the need to train all pilots in the technical aspects of aviation. "No officer," the Inspector General's report concluded, "should be given a pilot's license until he has mastered the principles in detail, of construction, especially of the engine."[4] As a result of this review, the Signal Corps hired one of the nation's early aviation experts, Grover C. Loening, as its first aeronautical engineer, and employed six civilian mechanics. Loening had a free rein under Captain Cowan to reorganize the school's system of maintenance engineering, procurement, and training.[5]

Cowan established an Experimental and Repair Department with Loening in charge and Lieutenant Milling as his assistant. Within this department, Lieutenant Douglas B. Netherwood served as officer-in-charge of the Motor Overhaul Section, while Lieutenant Walter R. Taliaferro headed the Training Department which included the Airplane Repair Section, Engine Repair Section, and School Section. Under civilian mechanic George Hallet, the School Section taught airplane and engine maintenance to officers and enlisted personnel. For the first time, aviation personnel took a short step toward multilevel maintenance. Under the new organization, the Experimental and Repair Department accomplished major repairs while the individual aircraft crews did daily maintenance and minor work.[6]

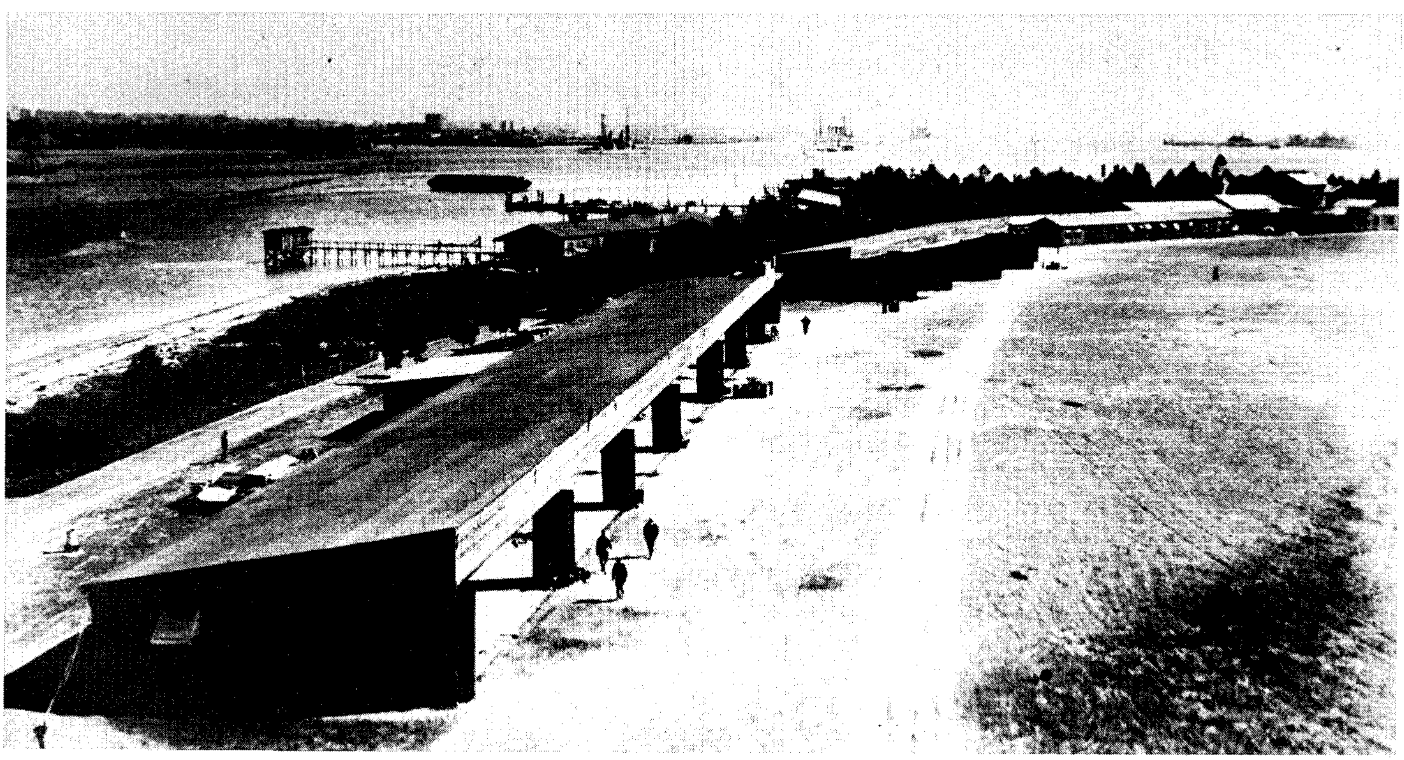
Lieutenant Taliaferro opened the Airplane Repair Section in the end of one hangar where a small enlisted crew began rebuilding wings and fuselages. Previously, these had to be returned to the manufacturers for repair. Initially, two enlisted men repaired fuselages and covered wings with fabric. Another enlisted man did the woodworking, while a civilian employee manufactured metal fittings. Several experienced sergeants—including Herbert Marcus and Vernon Burge who had been with Lieutenant Foulois and *Signal Corps No. 1* at San Antonio—did the final assembly. Within a short time, however, the operation had expanded dramatically, taking over the hangar. Ultimately, the Airplane Repair Section proved so capable that it completely rebuilt several airplanes.[7]

The professionalism of aviation officers and enlisted personnel received a major boost during the summer of 1914. On July 18, the "Act to Increase the Efficiency of the Aviation Service of the Army" established the Aviation Section of the Signal Corps and increased the number of personnel from 24 officers and 115 enlisted men to 60 officers and 260 enlisted men. The newly created Aviation Section consisted of the Aeronautical Division in Washington, D.C., the Signal Corps Aviation School, and the 1st Aero Squadron, still based at the aviation school. For pilots, the Act introduced two aviation ratings, that of "Junior Military Aviator" and "Military Aviator," and, for the first time, authorized flight pay. For enlisted personnel, the Act created the category of "Aviation Mechanician" and provided a 50% increase in pay for those who earned the rating. This law gave the Aviation Section definite status within the Signal Corps, while its formal ratings and additional pay made aviation a much more attractive duty for high-quality officers and enlisted personnel.[8]

The Signal Corps Aviation School moved quickly to reward its most competent enlisted men. On January 29, 1915, a board of officers examined 38 candidates. The formal examination requirements emphasized the practical side of airframe and engine construction, maintenance, and repair. The first part of the test required the student to be able to make fittings, ribs, spars, struts, and wires; assemble, disassemble, and align an airplane; apply cloth and dope; and remove, repair, and replace tires. The second part required that the candidate be capable of cleaning an engine; grinding valves; adjusting clearances, timing valves, and spark; cleaning and repairing the magneto and firing system; and adjusting the carburetor. Twenty men received the new rating and higher pay on February 12.[9]

Concurrent with the advent of the new rating, the aviation school expanded its technical training program for both officers and enlisted personnel, developing the Technical Instruction School separate from the flying training program. The ultimate goal of the Technical Instruction School was to provide a systematic course of instruction for the care, repair, and operation of aeronautical engines and the care and repair of aircraft. Aviation School leaders used the course to identify the elements of maintenance and repair that had to be taught, develop appropriate training techniques, and establish an optimum course length. Officers and enlisted personnel received some of their instruction in the machine shop which went into operation on February 23. The course began with George Hallett lecturing to eight officers. Two additional officers and twenty-eight enlisted men joined the class in April. By July 1915, school officials could boast that the members of the class had learned more in six months than previous students had learned in years.[10]

On the surface, then, it would appear that by early 1915 the Signal Corps Aviation School was fully capable of performing its flying and maintenance training missions. But despite the many positive developments during 1914 and early 1915, several deficiencies appear to have impaired the school's operations. Certainly the worst problem was the mélange of aircraft and



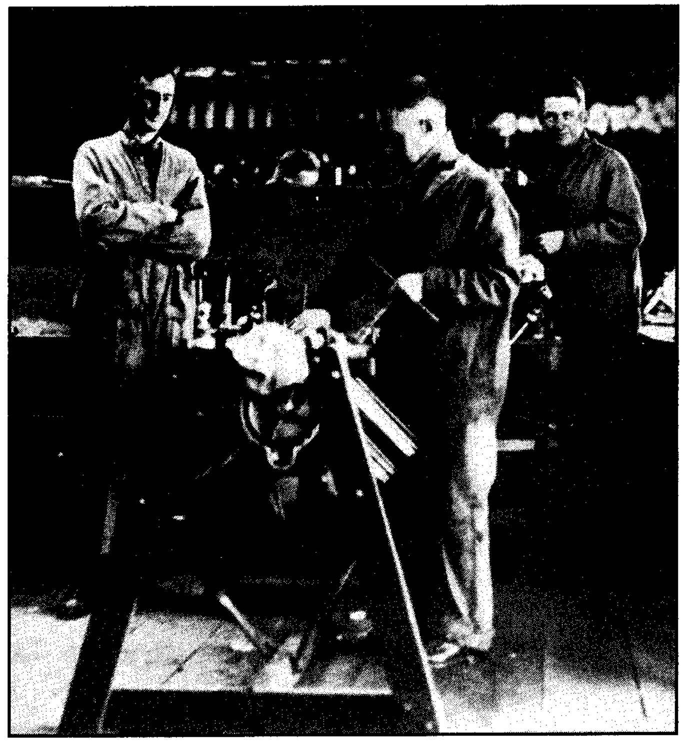
Signal Corps Aviation School at North Island, Circa 1916

engines. America's nascent aviation industry had yet to develop a suitable standard training airplane, while, at the same time, the Army's chronic shortage of funds forced it to buy aircraft in ones and twos, thus effectively preventing standardization. The Army lacked a standard trainer until the advent of the Curtiss JN-4 "Jenny" in late 1916. Consequently, instead of one or two standard aircraft and engines using interchangeable parts and serviced through standard maintenance techniques, the school's aerial fleet consisted of many different airplanes with all of the inefficiencies in maintenance and supply that the lack of standardization guaranteed. Further, dissimilarities between the aircraft at the school appear to have been increased by changes made during the frequent repairs and by the active test and modification program run by Grover Loening. The impact on flying training was serious.

On June 5, 1915, for example, the school had 14 aircraft: one Wright, five Martin of two different types, three Curtiss each of a different type, three Burgess, one Burgess-Dunne, and one original design by Loening. Of these, only five—the Curtiss J, the Curtiss flying boat, one Martin T, one Martin TT, and the Burgess-Dunne—were in commission. Nine days later, only three of these were available to the flying program. To power this motley assortment of aircraft, the school had 31 engines: 18 Curtiss in several models, 9 Renault, 2 Sturtevants, 1 Salmson, and 1 Austro-Daimler. Of these, only 11 engines—six Curtiss, three Renaults, the Salmson, and the Austro-Daimler—were in commission. None of the airplanes used the latter two engines, however, and spare parts were almost nonexistent for the Renaults thanks to the war in Europe. The variety of aircraft and engine types vastly increased the difficulty of supply and repair at the school.[11]

Supply presented a recurring problem. The Aviation School ordered engine and aircraft parts from the manufacturers through the Aeronautical Division in Washington and maintained few on hand thanks to the shortage of storage space. Often, parts had to be special ordered and repairs had to wait until they arrived.[12] "As it has been in 1914-1915 and especially of late, the rebuilding of aeroplanes and motors have been held up for days and for weeks due to the fact that some spare part is not on hand," one officer complained. "Many times these spares which held up the work would have caused but a few days delay and could have been kept on hand at a small cost very easily by forseeing [sic] the fact that they would have been needed here."[13] Spares for airplanes and engines could and should have been ordered periodically, or at least at the beginning of each fiscal year, but for some reason this was not done, despite recommendations for such action by the flying officers. Further, because of their complexity and fragility, the aircraft consumed spare parts and materials and demanded extensive maintenance far beyond that experienced by other Army units. The supply system that failed to adequately support the school's aircraft also adversely affected nonflying training. A persistent shortage of tools, raw materials, and equipment characterized the technical instruction program. At one point, for example, only one Curtiss engine was available for engine maintenance training where four were required.[14]

For non-aviation, or "general," supplies the school depended upon the quartermaster depot in San Francisco and, again, maintained limited stock at North Island. Shortages here included many standard Army items, ranging from tools to clothes.



Class in Engine Overhaul at North Island, Circa 1916

"Sufficient equipment should be furnished to all fliers," one officer pointed out in a report on the school, "so that they will not have to borrow from each other as they are now doing."[15] Noting that many enlisted men lacked complete uniforms, representatives of the Inspector General's office recommended in January 1915 that a larger stock of uniforms and clothing be kept on hand to alleviate shortages caused by delays in ordering clothes from the quartermaster depot. Further, they recommended that the school supply officer be removed from flying status, because that responsibility interfered with his duties. At least some of these shortages may have been alleviated with the assignment of a quartermaster to the school in late 1915.[16]

The temporary buildings the school occupied also affected the training program. The Coronado Beach Company, which owned North Island, notified the Army in December 1915 that it had plans to develop the island beginning in mid-1916; plans which did not include the Aviation School. This threat may have been nothing more than a negotiating ploy, but it was a reminder that the Army did not own the site, and the school commander had to operate under the shadow of the fact that his organization might be forced off the island with little notice. As a result, Aviation School personnel lived and operated in temporary facilities barely capable of housing the expanding activities. When Lieutenant Talliaferro's repair operation took over an entire hangar, as described above, it squeezed out other activities. Some supply shortages were directly attributable to a lack of adequate storage space, as already noted. The enlisted men's barracks, located in San Diego, was almost uninhabitable during the rainy season. Although the degree that the lack of adequate space and the semi-permanent facilities hampered training cannot be determined, these certainly had a detrimental impact on the program.[17]

Finally, some sections were undermanned and some school staff were less than capable. Captain Herbert A. Dargue's January 31, 1915, report on the Experimental and Repair

Department provided examples of both deficiencies. The senior civilian in the Drafting Division, according to Dargue, was poorly educated and completely unable to prepare the simplest written report. The civilian head of the Metal Working Division had none of the qualifications of a foremen, while two of the six enlisted men had to be shown every step of their work. The three enlisted men in the Wood Working Division and the one who comprised the staff of the Fabric and Dope Working Division were fully capable, but both sections lacked enough personnel to do their work. On the other hand, the enlisted storekeeper, Dargue claimed, was totally incapable of doing his job. The school also had a shortage of properly trained instructors, a situation complicated by the prevailing system which required instructors and students to do additional duties both on and off the post, thus interrupting the training program.[18]

The depth and quality of technical instruction at North Island may therefore be questioned. In early 1916, Lieutenants Howard C. Davidson and Ralph Royce found the level of technical training in such important areas as engine maintenance almost useless. To make up for that deficiency, they spent their spare time repairing automobile engines in a San Diego garage. "We worked for no pay," Davidson recalled years later, "and the other mechanics thought you couldn't be more stupid than a second lieutenant."[19]

By 1916, then, Signal Corps Aviation School officials had developed an elementary organization and supply and two-level maintenance system that provided support for school aircraft. The system, however, was less than satisfactory, partly because of the wide variety of aircraft and engines in use, the shortage of proper funds, the lack of proper facilities, and either the inability or failure to purchase parts, equipment, and materials in advance of need. Despite these deficiencies, the school officials had created a training program that provided pilots and mechanics to the Army air arm. But the evidence suggests that the technical and maintenance instruction accomplished by the school tended to be superficial.

Additionally, no matter what its internal strengths and weaknesses, the Signal Corps Aviation School also failed to translate into a practical aerial capability for the US Army. When aircraft and pilots joined the Army in the field, their absence either disrupted flying training or brought the program to a complete halt. When school machines joined the provisional 2nd Division at Texas City, Texas, in February 1913, as noted above, their absence almost put the Signal Corps Aviation School out of the pilot production business.[20] Creation of the 1st Aero Squadron in 1913 initially failed to solve this problem. In March, the nine airplanes at Texas City, Texas, became the 1st Aero Squadron (Provisional) with a headquarters and two aircraft companies. Later, the provisional designation was dropped. In June, the unit transferred to San Diego where it became the Wright section of the Signal Corps Aviation School. At San Diego, squadron personnel and aircraft functioned as part of the

Wing Repair in the Woodworking Shop at North Island, Circa 1916

Aviation School despite an operational organization and mission independent of the school. The original problem thus remained. On April 30, 1914, for example, the 1st Company went to Texas for several weeks, a move that cost the school a significant portion of its physical resources as well as the trained officers who had been serving as instructor pilots.[21]

Shortly after the 1st Company returned to San Diego in July 1914, newly promoted Captain Bennie Foulois took command of the 1st Aero Squadron and began placing it on an active footing separate from the school infrastructure. Herculean efforts equipped the squadron with eight standard Curtiss JN-2 aircraft, and most of the necessary engines, spares, equipment, and transport by the time it left for Fort Sill, Oklahoma, in July 1915.[22] Even then, the separation of operational squadron and aviation school remained incomplete. For the 1st Aero Squadron to operate, it proved necessary to take engines from the school. "It was quite a strain for us to give you those two motors," Captain Cowan reported to Foulois, "we are going to be hardput to keep our machines going until we get some more new motors."[23]

With the departure of the 1st Aero Squadron, the Signal Corp Aviation School reached its final form prior to World War I. Part of its problem had been addressed. School officials could devote themselves and the school's resources to instruction and no longer had to worry about meeting the operational demands of the US Army. On the other hand, the same resources devoted to maintaining the airplanes and equipment of the school were still required as part of the instructional program itself. This duality in purpose would continue until the tremendous expansion in aviation caused by America's entry into World War I forced the development of separate training programs for maintenance personnel.

NOTES

1. Brig. Gen. James Allen, "Report of the Chief Signal Officer," Oct 15, 1912, *War Department Annual Reports for 1912,* pp. 966, 968-969; H.H. Arnold, *Global Mission* (New York: Harper & Row, 1949), pp. 17, 30-31; Juliette A. Hennessy, *The United States Army Air Arm, April 1861-to April 1917*, new imprint (Washington, DC: Office of Air Force History, 1985), p. 47. For Foulois's experience with maintenance and supply at Fort Sam Houston, see Roger G. Miller, "*Signal Corps No. 1*: Purchasing and Supporting the Army's First Airplane," *Air Power History* (Fall 1994), pp. 14-21.
2. Maj. H.H. Arnold, "The History of Rockwell Field," 1923, pp. 20-21, Jones Collection, 168.65041, Air Force Historical Research Agency (AFHRA), Maxwell AFB, AL.
3. Brig. Gen. James Allen, "Report of the Chief Signal Officer," Oct 15, 1912, pp. 968-969; Charles DeForest Chandler and Frank P. Lahm, *How Our Army Grew Wings: Airmen and Aircraft Before 1914* (New York: The Ronald Press, 1943), pp. 258, 314-315; Hennessy, *The United States Army Air Arm*, pp. 47-58, 73-74, 76, 79, 86, 88, 91; Arnold, "History of Rockwell Field," pp. 22-23, 25, 28. Two other aviation establishments deserve mention. From March 1912 to January 1915, the Philippine Air School operated at Fort William McKinley, and a second school functioned in Hawaii from July 1913 until August 1914. Hennessy, *The United States Army Air Arm*, pp. 79-85.
4. Memo, Maj. Gen. William W. Wotherspoon, Chief of Staff, to the Adjutant General, Jun 11, 1914, File #2147824, Box 7468, RG94, Records of the Adjutant General's Office, National Archives (NA).
5. Arnold, "History of Rockwell Field," p. 31.
6. Royal D. Frey, "Evolution of Maintenance Engineering, 1907-1920," Historical Study No. 327 (Wright-Patterson AFB, OH: Historical Division, Air Materiel Command (Jul 1960), pp. 43-44.
7. Arnold, "History of Rockwell Field," pp. 45-46; Hennessy, *The United States Army Air Arm*, p. 122.
8. Brig. Gen. George B. Scriven, "Report of the Chief Signal Officer," Oct 3, 1914, *War Department Annual Reports for 1914*, pp. 505, 614-616; Army Air Forces Historical Studies No. 25, "Organization of Military Aeronautics, 1907-1935" (Dec 1944), pp. 18-19.
9. Frey, "Evolution of Maintenance Engineering," pp. 52-53.
10. *Ibid.*, pp. 51-52. Hennessy, *The United States Army Air Arm*, pp. 112, 143.
11. "Notes on Incorrect Information Given Congress and Public re: Report of the Chief Signal Officer to Sec. of War, 1913," 168.7119-6, and "Status of Aeroplanes on June 5, 1915," in File "Material re: Charges Against Signal Corps, 1913-1915," 168.7119-7, Herbert E. Dargue Papers, AFHRA.
12. File #2264139, Box 7784, RG94, NA; "List of Deficiencies Existing in School," n.d., in File "Material re: Charges Against Signal Corps, 1913-1915," pp. 20-27, 168.7119-7, Dargue Papers, AFHRA.
13. "List of Deficiencies Existing in School," n.d., in File "Material re: Charges Against Signal Corps, 1913-1915," pp. 20-27, 168.7119-7, Dargue Papers, AFHRA.
14. *Ibid.*
15. *Ibid.*
16. File #2264139, Box 7784, RG94, NA; Rpt, Col. D.C. Shanks, Insp. Gen., Western Dept., to Cmdr, Signal Corps Aviation School, subj: Irregularities and Deficiencies Observed at Inspection, January 22-26, 1915, Feb 2, 1915, File #38014, Box 489, RG111, Records of the Office of the Chief Signal Officer, NA.
17. Rpt, Col. D.C. Shanks, Insp. Gen., Western Dept., to Cmdr, Signal Corps Aviation School, subj: Irregularities and Deficiencies Observed at Inspection, January 22-26, 1915, Feb 2, 1915, File #38014, Box 489, RG111, Records of the Office of the Chief Signal Officer, NA; Arnold, "History of Rockwell Field," pp. 52-54.
18. "List of Deficiencies Existing in School," nd, p. 24, and "Personnel of Experimental & Repair Dep't," Jan 31, 1915, pp. 134-35, in File "Material re: Charges Against Signal Corps, 1913-1915," 168.7119-7, Dargue Papers, AFHRA.
19. Intvw, "Maj. Gen. Howard C. Davidson," Dec 5-8, 1974, pp. 152-53, United States Air Force Oral History Interview, K239.0512-817, AFHRA.
20. Brig. Gen. James Allen, "Report of the Chief Signal Officer," Oct 15, 1912, p. 968; Hennessy, *The United States Army Air Arm*, pp. 62, 71, 73-74.
21. Hennessy, *The United States Army Air Arm*, pp. 74, 76, 79, 119-20; Chandler and Lahm, *How Our Army Grew Wings*, pp. 276, 314-15.
22. Brig. Gen. George B. Scriven, "Report of the Chief Signal Officer," Oct 3, 1914, p. 518; Hennessy, *The United States Army Air Arm*, p. 120. See Maurer Maurer, "The 1st Aero Squadron," *The Air Power Historian* (Oct, 1957), pp. 207-12, for a short history of the unit.
23. Ltr, Capt. Cowan to Capt. Foulois, Aug 20, 1915, File Personal Correspondence, 1915, Box 35, Foulois Papers, Library of Congress.

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Logistics Life After Military Retirement

Colonel David C. Davis, USAF (Retired)

The second-best bit of advice I ever received was in 1968 from a Colonel at Incirlik AB Turkey, who said, "Spend an hour, preferably two, each day reading something that has nothing directly to do with your job." We were authorized four maintenance officers, and I was the only one there, so I naturally assumed the Colonel knew nothing of what was going on! Now, I agree with him, and the balance of this article may have nothing directly to do with your job, but may have everything to do with your future as a logistician.

Having recently retired after 26 years in various Air Force logistics positions and finally as a Logistics Group Commander, I offered to articulate for the *Air Force Journal of Logistics* what it is like on retirement. There are three categories, roughly, I should point out:

(1) What I have found that I expected.
(2) What I have found unexpected.
(3) What I have not found.

Expected Findings

There are numerous things a retiree might rightly expect. You will really miss the camaraderie of the services, especially the closeness of friends and feelings of extended family made in overseas assignments. The civilian world is not exactly cold and unforgiving, but that special something in the military that brings people together and look out for each other is not there.

As logisticians, you might expect some confusion in the public eye about what logistics is or is not. You will not be disappointed in that expectation. On the other hand, there is no small amount of confusion among logisticians as well. Quibbling about definitional issues may continue, but I recommend one overriding perspective for you: Articulate logistics as opportunity, not liability. Emphasize logistic potential for adding value and opportunity exploitation rather than necessary costs and evils.

Unexpected Findings

There is a certain fascination in the corporate entities with the new, the modern, sometimes at the expense of giving up on the fundamentals. Part of this is the need to differentiate themselves from the competition. But another part is the societal tendency to live or die by the sound bite, as even the Gettysburg Address would have been too long for TV news.

Another surprise, at least to me, was the wide variance of perceptions of military officers. It is much, much better in recent years than during and just after the Vietnam War, of course. But many people get their opinions of military officers from entertainment and view military officers much like Frank Burns on the older M.A.S.H. episodes—pompous and ineffective, wasting subordinates' skills on painting rocks and marching in war zones. Others, even those who themselves are retired military people, consider senior officers with suspicion. An assumption I ran into on several occasions was that if you had been a Colonel, you hadn't really worked in the last five years and have probably forgotten how. Another assumption was that you claimed achievements on your résumé you couldn't possibly have done without lots of people running around doing your bidding; something "our company cannot afford in these competitive times."

As a career logistician, I cannot remember finding myself out of work to do, nor do I recall ever having enough manpower to run about doing my jobs for me. By all means, credit those who achieve things as they are doing it, and continue that credit as you articulate in your retirement résumés how things were achieved and your role in them.

Things Not Found

There is no consistency in résumés: their preparation, their formats, or even how they are read. Perhaps that is why there is a cottage industry out there to assist you. I will not attempt to compete there, but I have found some things that apply to logisticians.

It is crucial that you articulate what you do (or did) versus what your organization you lead (or led) achieved. Do not claim achievements you did not or could not do. For example, despite years in aircraft maintenance, I cannot and never did fix an aircraft. But do specify your leadership or management actions that allowed and encouraged the cited achievements.

Do not assume some measure common in military logistics will be understood in the same way or even recognized in the industrial world.

Spend time—a lot of time—years, in fact—learning to articulate what you do in the language and priorities of the persons with whom you are communicating. Begin by an almost maniacal avoidance of acronyms. This will make you a better logistician in the military, as well as better prepare you for life after military retirement.

Above all, it will help you sell yourself and your logistics craft to people who, whether they know it now or not, really do "... need some of that logistics stuff."

By the way . . . The first-best bit of advice I ever got? Dr Art Sweeney, in 1965, when I was still a single student wondering how he got anything done with eight children at home advised as follows: Raising children is a piece of cake. In fact, we do quite well. Raising adults is the challenge, and thinking of the task that way makes all your decisions, from the cradle forward, easier.

Mr Davis is presently Senior Logistician, Science Applications International Corporation (SAIC), Albuquerque, New Mexico.

Defense Logistics Agency Renames Three Supply Centers

The Defense Logistics Agency (DLA) is changing the names of three inventory control points (ICPs) as a result of new responsibilities each are to assume over the next few years, Air Force Major General William P. Hallin, director of materiel management, recently announced.

The three centers are the Defense General Supply Center (DGSC), Richmond, Virginia; the Defense Construction Supply Center (DCSC), Columbus, Ohio; and the Defense Personnel Support Center (DPSC), Philadelphia, Pennsylvania. The new names will be Defense Supply Center, Richmond, Columbus, and Philadelphia, respectively. Effective dates for the changes vary, based on planned changes being made to the Agency's structure for item management and purchasing.

The name changes reflect the changing missions of the centers. These three centers are gradually gaining new responsibilities and buying many thousands of different items than their original titles indicate—a result of DLA's efforts to increase the effectiveness and efficiency of how they manage and purchase goods.

The intent of the name change is that when customers think about buying a crane or forklift, for example, they should think about the Defense Supply Center, Columbus, instead of a name that implies the center only buys construction equipment or certain classes of commodities.

As the Agency begins to realign management responsibility for more than one million supply items, it is creating two centers that buy equipment used in military weapons systems and another that specializes in buying troop and general support items such as food and clothing. DCSC and DGSC will become these two weapons systems support ICPs, and DPSC will realign to form the troop and general support ICP. These changes will make DLA appear more seamless to its customers, and will provide more management flexibility.

This realignment, in the types of items handled by its supply centers, will not result in additional activities. Moreover, DLA will continue to reduce its infrastructure, consolidate, and realign its operations to be more efficient, as is being done throughout the Department of Defense.

DLA Organizational Structure

Today's Defense Logistics Agency was founded in October 1961 by Secretary of Defense Robert McNamara as the Defense Supply Agency (DSA) and began operations on 1 January 1962. As part of its creation, DSA turned eight single-manager agencies, originally owned by the military services, into six DSA supply centers. They included: Defense General Supply Center (DGSC), Defense Construction Supply Center (DCSC), Defense Electronics Supply Center (DESC), Defense Personnel Support Center (DPSC), Defense Industrial Supply Center (DISC), and Defense Fuel Supply Center (DFSC).

Headquartered at Fort Belvoir, Virginia, DLA annually provides its customers in the military Services and federal agencies with more than $11 billion of food, clothing, medical supplies, spare parts, fuel, electronics, and construction materials. Its Defense Contract Management Command administers more than 370,000 prime contracts, valued at more than $849 billion, for the military Services and various federal agencies. DLA also provides an array of technical and logistics support services for its customers.

Effective 31 December 1995, the Defense General Supply Center (DGSC), Richmond, Virginia, became Defense Supply Center, Richmond (DSCR). Known locally as Bellwood, DGSC was founded in 1942 as the Richmond Quartermaster Depot, and became part of DLA in 1961.

The Defense Construction Supply Center (DCSC) in Columbus, Ohio, was renamed the Defense Supply Center, Columbus (DSCC), effective 31 December 1995. The Columbus center was founded in 1918, and became part of DLA in 1961. The Defense Electronics Supply Center (DESC), in Dayton, Ohio, will retain its name, until the organization moves in December 1996 to the Defense Supply Center, Columbus. Founded in 1961, DESC's move is a result of recommendations made in 1993 by the Base Realignment and Closure Commission.

The Defense Personnel Support Center (DPSC) in Philadelphia, Pennsylvania, will be renamed the Defense Supply Center, Philadelphia (DSCP), at a later date yet to be determined. The Defense Industrial Supply Center (DISC), also in Philadelphia, will retain its current name until it is realigned with DSCP. Both changes are being made to reflect changes mandated by the Base Realignment and Closure Act (BRAC) of 1995, as well as changes generated by the overall realignment of all similar defense facilities. DPSC was founded in 1965 when DLA consolidated the Defense Clothing Supply Center, the Defense Subsistence Supply Center, and the Defense Medical Supply Center. DISC was established in 1962 when DLA assumed management of the purchase of industrial-type items.

The Defense Fuel Supply Center (DFSC), Fort Belvoir, Virginia, will retain its current name, since it will continue to specialize in the procurement of fuel and related supplies.

Public Affairs Office
Defense Logistics Agency
Fort Belvoir, Virginia